CANADIAN THESES ON MICROFICHE

THÈSES CANADIENNES SUR MICROFICHE

National Library of Canada
Collections Development Branch

Canadian Theses on
Microfiche Service

Ottawa, Canada
K1A 0N4

Bibliothèque nationale du Canada
Direction du développement des collections

Service des thèses canadiennes
sur microfiche

NOTICE

The quality of this microfiche is heavily dependent upon the quality of the original thesis submitted for microfilming. Every effort has been made to ensure the highest quality of reproduction possible.

If pages are missing, contact the university which granted the degree.

Some pages may have indistinct print especially if the original pages were typed with a poor typewriter ribbon or if the university sent us an inferior photocopy.

Previously copyrighted materials (journal articles, published tests, etc.) are not filmed.

Reproduction in full or in part of this film is governed by the Canadian Copyright Act, R.S.C. 1970, c. C-30. Please read the authorization forms which accompany this thesis.

AVIS

La qualité de cette microfiche dépend grandement de la qualité de la thèse soumise au microfilmage. Nous avons tout fait pour assurer une qualité supérieure de reproduction.

S'il manque des pages, veuillez communiquer avec l'université qui a conféré le grade.

La qualité d'impression de certaines pages peut laisser à désirer, surtout si les pages originales ont été dactylographiées à l'aide d'un ruban usé ou si l'université nous a fait parvenir une photocopie de qualité inférieure.

Les documents qui font déjà l'objet d'un droit d'auteur (articles de revue, examens publiés, etc.) ne sont pas microfilmés.

La reproduction, même partielle, de ce microfilm est soumise à la Loi canadienne sur le droit d'auteur, SRC 1970, c. C-30. Veuillez prendre connaissance des formules d'autorisation qui accompagnent cette thèse.

THIS DISSERTATION
HAS BEEN MICROFILMED
EXACTLY AS RECEIVED

LA THÈSE A ÉTÉ
MICROFILMÉE TELLE QUE
NOUS L'AVONS REÇUE

Canada

NL-339 (r. 85/08)

National Library of Canada / Bibliothèque nationale du Canada

Ottawa, Canada
K1A 0N4

120

TC –

ISBN 0-315-01314-0

CANADIAN THESES ON MICROFICHE SERVICE – SERVICE DES THÈSES CANADIENNES SUR MICROFICHE

PERMISION TO MICROFILM – AUTORISATION DE MICROFILMER

• Please print or type – Écrire en lettres moulées ou dactylographier

AUTHOR – AUTEUR

Full Name of Author – Nom complet de l'auteur

OLGA SZAFRAN

Date of Birth – Date de naissance	Canadian Citizen – Citoyen canadien
June 17, 1957	☑ Yes / Oui ☐ No / Non
Country of Birth – Lieu de naissance	**Permanent Address – Résidence fixe**
Poland	11911-92 Street Edmonton, Alberta T5G 1A7

THESIS – THÈSE

Title of Thesis – Titre de la thèse

Utilization of Acute Care Hospitals by the Elderly in Alberta

Degree for which thesis was presented Grade pour lequel cette thèse fut présentée	Year this degree conferred Année d'obtention de ce grade
M.H.S.A.	1985
University – Université	**Name of Supervisor – Nom du directeur de thèse**
University of Alberta	Dr. Kyung Bay

AUTHORIZATION – AUTORISATION

Permission is hereby granted to the NATIONAL LIBRARY OF CANADA to **microfilm** this thesis and to **lend** or **sell copies of the film.**

The author reserves other publication rights, and neither the thesis nor extensive extracts from it may be printed or otherwise reproduced without the author's written permission.

L'autorisation est, par la présente, accordée à la BIBLIOTHÈQUE NATIONALE DU CANADA de **microfilmer** cette thèse et de **prêter** ou de **vendre des exemplaires du film.**

L'auteur se réserve les autres droits de publication; ni la thèse ni de longs extraits de celle-ci ne doivent être imprimés ou autrement reproduits sans l'autorisation écrite de l'auteur.

ATTACH FORM TO THESIS – VEUILLEZ JOINDRE CE FORMULAIRE À LA THÈSE

Signature	Date
O. Szafran	April 23, 1985

NL-91 (r. 84/03)

Canada

THE UNIVERSITY OF ALBERTA

UTILIZATION OF ACUTE CARE HOSPITALS BY THE ELDERLY IN ALBERTA

by

OLGA SZAFRAN

(C)

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF HEALTH SERVICES ADMINISTRATION

DEPARTMENT OF HEALTH SERVICES ADMINISTRATION AND COMMUNITY MEDICINE

EDMONTON, ALBERTA

SPRING, 1985

THE UNIVERSITY OF ALBERTA

RELEASE FORM

NAME OF AUTHOR OLGA SZAFRAN

TITLE OF THESIS UTILIZATION OF ACUTE CARE HOSPITALS BY THE ELDERLY IN ALBERTA

DEGREE FOR WHICH THESIS WAS PRESENTED MASTER OF HEALTH SERVICES ADMINISTRATION

YEAR THIS DEGREE GRANTED SPRING, 1985

Permission is hereby granted to THE UNIVERSITY OF ALBERTA LIBRARY to reproduce single copies of this thesis and to lend or sell such copies for private, scholarly or scientific research purposes only.

The author reserves other publication rights, and neither the thesis nor extensive extracts from it may be printed or otherwise reproduced without the author's written permission.

(SIGNED) Olga Szafran

PERMANENT ADDRESS:

11911-92 Street
Edmonton, Alberta
T5G 1A7

DATED April 18 1985

THE UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled UTILIZATION OF ACUTE CARE HOSPITALS BY THE ELDERLY IN ALBERTA submitted by OLGA SZAFRAN in partial fulfilment of the requirements for the degree of MASTER OF HEALTH SERVICES ADMINISTRATION.

Kyung Bay
Supervisor

J. B. Newhouse

Sarah Lou Kerr

Date April 18, 1985

ABSTRACT

Demographic changes in the age structure of the population, in particular the unprecedented growth in the elderly, and rapidly rising health care costs coupled with shrinking health resources, have combined to generate a growing concern for health care administrators, planners and policy makers regarding the utilization of health services by the elderly. This study was thus undertaken to investigate the trends and patterns of acute care hospital utilization by the elderly within the Alberta hospital system.

The general research strategy was of an exploratory, descriptive and comparative nature, employing retrospective, longitudinal data and spanning the period January 1, 1971 to March 31, 1982. Professional Activity Study (PAS) data, in the form of computerized separation abstracts, constituted the main data base of the study. The data analytic strategies undertaken included: (1) the comparison of provincial rates and trends in hospital utilization between the elderly and nonelderly segments of the Alberta population; (2) the analysis of interdistrict and geographic regional variations in hospital utilization by the elderly; and (3) the examination of hospital care-seeking patterns by the elderly by means of patient origin-destination analysis.

The major findings of this study were as follows:

1) A trend toward declining hospital utilization rates was

evident for both the elderly and nonelderly segments of the population, however, the decrease was relatively more pronounced for the nonelderly.

2) Despite declining per capita hospital utilization rates, the relative proportion of elderly separations and patient-days to that of the total population had increased over the years.

3) Within the elderly age group, all hospital utilization measures tended to increase with increasing age; however, whereas rates for the 65-69 and 70-74 year age groups decreased over time, those for the 75 year and over age group remained stable.

4) A high degree of variability in utilization rates existed among hospital districts and geographic regions. Districts with high and very high utilization rates represented a broad geographic area, however, accounted for less than 28 percent of the total elderly service population.

5) Metropolitan areas demonstrated the highest elderly average length of stay, but low separation and patient-day rates. Regional areas had intermediate separation and patient-day rates and low average length of stay. However, rural areas exhibited the highest elderly separation and patient-day rates, but the lowest average length of stay. Elderly average length of stay in rural areas had exceeded that of regional areas since 1977.

6) Most elderly patients tended to receive hospital care within their area/region of residence; however, when seeking care outside the area of residence, rural elderly patients tended to bypass regional hospitals and seek care mainly in metropolitan areas.

7) The service commitment of hospitals to the elderly residing within their area decreased as one moved from rural to regional to metropolitan areas. The outside service commitment of both metropolitan and regional hospitals was to rural residents, with this trend increasing over time.

Based on the findings, there was some indication that: (1) the declining trends in total population hospital utilization had occurred primarily at the "expense" of the nonelderly, with the elderly "burden" on acute care hospitals increasing over time; (2) high per capita rates of hospital utilization was a rural phenomenon; (3) the concept of distance minimization to care facility was seemingly applicable to the hospital care-seeking patterns of the elderly; and (4) acute care beds in some small rural districts in the province may have been used in a long-term care capacity.

Recommendations for planning, policy development, and further research arising from the study results and related conclusions were offered.

ACKNOWLEDGEMENTS

Sincere appreciation is extended to Dr. Kyung Bay, Thesis Committee Chairman, for his time, valued guidance, and professional expertise accorded to the completion of this thesis.

The contributions and special accommodations made by thesis committee members, Professor Joseph Newhouse and Dr. Janet Kerr, were gratefully appreciated.

An expression of appreciation is extended to the Faculty and staff of the Department of Health Services Administration and Community Medicine for their continuing emphasis on high standards in education and for endeavoring to instill a commitment to continuing self-education in health services administration.

With deep indebtedness, sincere thanks are extended to Mr. Gordon Pincock for his continued encouragement regarding the completion of this thesis. His enthusiasm, energy and professionalism have been a continued source of stimulation and challenge.

In appreciation, I thank Miss Shirley Bernard for typing and editing parts of the manuscript, Mrs. Annie Re for the graphic design work, and Miss Margaret Paridaen for preparing the Tables.

Finally, with deepest heartfelt appreciation, I thank my family and friends for their patience, encouragement, and support during the completion of this thesis.

TABLE OF CONTENTS

Page

ABSTRACT iv

ACKNOWLEDGEMENTS vii

TABLE OF CONTENTS viii

LIST OF TABLES xi

LIST OF FIGURES xiii

CHAPTER

I. INTRODUCTION 1

1.1 Statement of the Problem..... 1
1.2 Study Objectives..... 3
1.3 Significance of the Study 4
1.4 Scope, Assumptions and Limitations 6
1.5 Definitions of Terms..... 11
1.6 Thesis Format..... 12

II. A SELECTIVE REVIEW OF THE LITERATURE..... 14

2.1 Concepts Related to Health Services Utilization..... 14
2.1.1 Concept of the Health System..... 15
2.1.2 Macro-System and Micro-System Perspective 17
2.1.3 Concepts of Need, Demand and Utilization 18
2.1.4 Research Approaches 22
2.1.5 Summary 25

2.2 Determinants of Health Services Utilization 26
2.2.1 Societal Determinants 27
2.2.2 Health Delivery System Determinants 29
2.2.3 Individual Determinants 32
2.2.4 Summary 37

2.3 Utilization of Health Services by the Elderly 38
2.3.1 Demographic Trends 39
2.3.2 Hospital Utilization..... 42
2.3.3 Factors of Utilization..... 44
2.3.4 Long-Stay and Bed Blocking..... 51

2.3.5 Summary 62

2.4 Patient Origin-Destination Studies 63
2.4.1 Patient Care-Seeking Patterns..... 64
2.4.2 Service Area and Service Population . 68
2.4.3 Resource Utilization..... 72
2.4.4 Summary 76

2.5 Literature Review Summary 77

III. METHODOLOGY 79

3.1 Conceptual Framework and Research Strategy . 79
3.1.1 Conceptual Framework 80
3.1.2 General Research Strategy 83

3.2 Data Sources..... 87
3.2.1 Census Data 87
3.2.2 Professional Activity Study (PAS) Data 90
3.2.3 Provincial Annual Reports 95

3.3 Data Analysis Strategies 97
3.3.1 Provincial Analysis 98
3.3.2 Hospital District Analysis 99
3.3.3 Regional Analysis 100
3.3.4 Patient Origin-Destination Analysis 107

3.4 Methodology Summary 115

IV. RESULTS 118

4.1 Alberta Profile 118
4.1.1 Population Trends 119
4.1.2 Alberta Hospital System 123

4.2 Provincial Utilization Trends 127
4.2.1 Total Population Utilization Trends 127
4.2.2 Elderly and Nonelderly Utilization Trends 132
4.2.3 Summary of Findings 141

4.3 District Variation in Utilization Rates ... 143

4.4 Regional Variation in Utilization Rates ... 151
4.4.1 Metro-Calgary and Metro-Edmonton ... 152
4.4.2 Metropolitan, Regional and Rural Areas ... 162
4.4.3 Calgary, Edmonton, Grande Prairie, Lethbridge, Medicine Hat and Red Deer Regions ... 169
4.4.4 Summary of Findings ... 172

4.5 Patient Origin-Destination Analyses ... 175
4.5.1 Community (District) Perspective - Relevance Indices ... 176
4.5.2 Provider (Hospital) Perspective - Commitment Indices ... 187
4.5.3 Summary of Findings ... 202

4.6 Summary of Results ... 203

V. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS ... 208

5.1 Summary of the Study ... 208
5.2 Major Findings ... 210
5.3 Conclusions ... 214
5.4 Recommendations ... 216

REFERENCES ... 219

APPENDIX A: METHODOLOGY SUPPLEMENT ... 232

LIST OF TABLES

Table		Page
1	Alberta Population Trends for Census Years 1971, 1976 and 1981	120
2	Supply of Acute Care, Long-Term Care and Nursing Home Beds in Alberta: 1971-1981	126
3	Elderly, Nonelderly and Total Population SEPS and PDAYS: 1971-1981/82	129
4	Percentage Increase in SEPS, PDAYS and ALOS for the Elderly, and Total Population	130
5	Total Alberta Population Hospital Utilization Trends: 1971-1981/82	131
6	Trends in SEPRATEs for the Elderly and Nonelderly Population: 1971-1981/82	135
7	Trends in PDAYRATEs for the Elderly and Nonelderly Population: 1971-1981/82	138
8	Trends in ALOS for the Elderly and Nonelderly Population: 1971-1981/82	140
9	Distribution of Districts and Service Population by Levels of Elderly Hospital Utilization For All Years Combined	145
10	Trends in Elderly SEPRATEs for Regional Areas in Alberta: 1971-1981/82	153
11	Comparative Profile of Trends in Elderly SEPRATEs for Regional Areas in Alberta: 1971-1981/82	155
12	Trends in Elderly PDAYRATEs for Regional Areas in Alberta: 1971-1981/82	156
13	Comparative Profile of Trends in PDAYRATEs for Regional Areas in Alberta: 1971-1981/82	158
14	Trends in Elderly ALOS for Metropolitan, Regional and Rural Areas	159
15	Trends in RIs and ALOS for Metropolitan, Regional and Rural Areas	177
16	Trends in RIs and ALOS for Six Regional Areas	182

Table		Page
17	Trends in CIs and ALOS for Metropolitan, Regional and Rural Hospitals	189
18	Trends in CIs and ALOS for Hospital Groups of Six Regions	191
19	Trends in CIs for Metro-Calgary and Metro-Edmonton Hospitals	195
20	Trends in CIs for Metro-Calgary andd Metro-Edmonton Hospitals to Eight District Areas	199

LIST OF FIGURES

Figure		Page
1	Conceptual Model of Health Services Utilization by the Elderly	81
2	Configuration of General Hospital Districts in Alberta	96
3	Configuration of Metropolitan, Regional and Rural Hospital Districts	105
4	Configuration of Six Regional Areas	108
5	Geographic Distribution of Levels of Elderly PDAYRATEs for All Years Combined	148
6	Trends in Elderly PDAYRATEs for Metropolitan, Regional and Rural Areas	165
7	Trends in Elderly ALOS for Metropolitan, Regional and Rural Areas	167
8	Trends in Elderly PDAYRATEs for Regional Areas	171
9	Trends in Elderly ALOS for Regional Areas	173

CHAPTER I

INTRODUCTION

Projected demographic changes in the age structure of the population and rapidly rising health care costs, coupled with shrinking health resources, have combined to generate a growing interest in the utilization of health services by its heaviest consumers, the elderly. One area of significant interest and concern is the elderly's use of acute care hospital beds, the most costly component of the health care resources. Accordingly, the focus of this study is on selected aspects of the inpatient utilization of Alberta's acute care hospitals, from 1971 to 1981/82, by those aged sixty-five years and over (the elderly) and on related implications for health care planning and policy formulation.

1.1 Statement of the Problem

Increasing emphasis on cost containment in the health care delivery system and the major contribution of hospitalization to the cost of health care has provided the impetus for health care administrators, policy makers, planners, and researchers to examine and evaluate acute care hospital utilization patterns. In this regard, the utilization of acute care hospitals by the elderly segment of the population is of significant interest and importance.

Those aged sixty-five years and over have an impact on inpatient hospital use that is disproportionate to their share of the population (Wilson, 1981). Anticipated future increase in the elderly population, both in absolute number and in relative proportion of the total population, is expected to further increase their utilization. In 1971, the elderly comprised 8 percent of the total Canadian population and accounted for 35 percent of the patient-days in general hospitals. Estimates indicate that, by the year 2001, the elderly will comprise 12 percent of the Canadian population and will consume approximately 45 percent of the acute care hospital resources, as measured in terms of patient-days (Health and Welfare Canada, 1975).

The mere fact of advanced age and the relatively high prevalence of chronic disease places the elderly in a position of greater need for care, thus resulting in the higher overall consumption of health services. Whereas the provision of health services has evolved into a highly complex, specialized *cure* of acute illness-oriented, and costly health care industry, the care needs of the heaviest utilizers of the system, the elderly, are for less specialized *care* of chronic disability. Moreover, the combination of a lack of community and other care-related support, and the presence of financial incentives for both physicians and the elderly to utilize acute care facilities, serves to place a further strain on limited acute care resources. Marked developments in highly specialized and

expensive medical technology have resulted in the adoption of an at-any-cost approach to the treatment of illness for both the young and old. In light of these developments and the characteristically more lengthy periods of convalescence associated with multiple diagnoses, the elderly are often charged with bed blocking and misutilization of acute care beds. The fact that the aged tend to be geographically less mobile suggests that problems related to health services utilization by the elderly may manifest regional variability.

Given the overall scope and complexity of the foregoing problem, an investigation of its impact on acute care hospital utilization patterns is deemed essential and of significant value for health care planning and policy making. In this regard, this longitudinal, exploratory, population-based study is undertaken to analyze acute care hospital utilization patterns, from 1971 to 1981/82, by the elderly in the province of Alberta.

1.2 Study Objectives

The primary purpose of this study is to conduct a longitudinal, exploratory, population-based, and comparative analysis of the utilization patterns of Alberta's acute care hospitals by the elderly in order to obtain pertinent information for health care planning and policy making. More specifically, the following research objectives are established:

1) by employing an epidemiological, demographic perspective, based on defined populations, to study rates and trends in acute care hospital utilization by the elderly population in Alberta, over a period of eleven years, 1971 to 1981/82, and to compare their utilization experience to that of the rest of the population (nonelderly);
2) to describe the elderly's hospital utilization experience with regard to district and regional rate variability; thereby, to identify geographic parameters which may influence acute care hospital utilization by the elderly; and
3) to investigate hospital care-seeking patterns by the elderly in the province by means of patient origin-destination analysis.

Further to the primary objectives, the overall intent of this study is to obtain pertinent information concerning the volume and patterns of hospital utilization by the elderly, and to analyze those implications suggested by the findings which will be useful to health care administrators, planners, and policy makers.

1.3 Significance of the Study

In general terms, the analysis of health services utilization behavior facilitates the understanding of: (1) the distribution of health resources across the population; (2) the association between utilization of services and health

status; and (3) the relationship between volume and patterns of utilization and strategies for controlling the spiral of health care expenditures. Consequently, such research contributes to the development of a comprehensive information base for future health care planning and policy making.

More specifically, the changing age structure of the population and the increasing demand on the health care system by the elderly render the investigation of the elderly's hospital utilization patterns of prime importance. The focus on inpatient hospital utilization is especially significant as this is the most costly form of care and is, to a large extent, contingent on physician, not patient, decisions.

The extended longitudinal nature of the study will facilitate trend analysis and provide a firm base from which to project future hospital utilization trends for the elderly in the province. The scope of the analysis encompassing a full urban-rural continuum of hospital utilization behavior will provide valuable information for health services planning for the elderly, from a regional and provincial perspective. Derivation of population-based utilization rates will facilitate meaningful comparisons between different geographic areas. Information regarding regional variation in patterns of utilization may possibly detect discrepancies in the availability of and/or accessibility to certain types of services for the elderly,

thus may identify areas requiring further study. Patient origin-destination analysis will establish a basis for identifying geographic parameters which may influence hospital utilization by the elderly.

Overall, the findings may provide valuable input into explaining differences in hospital operating costs and the efficient utilization of acute care beds; geriatric health education and manpower requirements; and the changing future roles of the acute care hospital. As such, the utility of routinely-collected administrative and clinical data will be demonstrated in relation to its value for health services research and planning.

1.4 Scope, Assumptions and Limitations

The overall scope of the study encompasses a longitudinal, exploratory, population-based, comparative analysis, employing a demographic and geographic approach, of the volume and patterns of utilization of acute care hospitals in the province of Alberta by those aged sixty-five years and over. The analysis is restricted to Alberta residents hospitalized in acute care hospitals in the province from January 1, 1971 to March 31, 1982, inclusive. The determination of whether or not the province has had a sufficient supply of hospital beds, during the study period, to meet the health needs of the elderly is deemed beyond the scope of this study.

The objectives and the methodology of this study are based on the presupposition of the following research assumptions:

1) For the conceptual and analytic purposes of this study, Alberta is considered as having a closed acute care hospital system, thus, hospital utilization by nonresidents and the utilization of out-of-province acute care hospitals by Alberta residents are assumed to have negligible impact on the final results. Although data on hospital utilization by nonresidents are available, complementary data on Alberta residents seeking care outside the province are not readily accessible; consequently, this necessitates restricting the analysis to the utilization of Alberta hospitals by Alberta residents only.

2) The inability of the utilization data to discriminate between true needs for acute care and false needs served, and the unavailability of data on unmet health care needs in the population, make it necessary to assume that current utilization rates, when aggregated at the provincial level, approximate true needs for acute hospital care in the province. (Utilization data are limited in that they collectively measure true needs demanded and served, false needs demanded and served, and true needs not demanded but served, but exclude true needs demanded but not served and true needs not demanded and not served). Assessing, with any

real accuracy, the magnitude of misutilization of acute care beds by the elderly is beyond the scope of this study.

3) To facilitate the examination of regional variability in rates and patterns of hospital utilization, it is assumed that the provincially-defined hospital districts are methodologically acceptable geographic divisions and thus are appropriate geographic units of analysis. Furthermore, the assumption is made that several hospital districts can be combined to form larger regions.

4) The main data source for this study is Professional Activity Study (PAS) data, collected and coded by numerous persons throughout the province over a period of eleven years. As such, the quality of the data is beyond this investigator's control. Thus, the assumption that the data are reasonably accurate, adhere to the specified coding definitions and guidelines, and have been coded consistently over coders (not necessarily over time, as definitions may change over time), is absolutely fundamental with respect to the reliability and validity of this research.

This study is subjected to the following data, analytic, and research methodology <u>limitations</u>:

1) Employing PAS separation abstracts as the data source for this study limits the research unit of analysis to

the hospital separation episode, rather than to the individual patient. Given the relatively high prevalence of repeated hospitalizations and inter-hospital transfers for the elderly population, utilization rates based solely on hospital separations will markedly over-represent the actual number of individual patients. To offset this limitation, the patient-day is also employed as a measure of hospital utilization.

2) The vast quantity of data, coupled with the fact that it has been obtained from external sources, renders the testing for data reliability and validity impractical and exceeding the scope of this study. The analyses, therefore, are limited to the assumption that the data exhibit reliability and validity, which is partly supported by the fact that PAS consistently administer quality checks on the data. The study should not be compromised by this limitation.

3) Characteristically, census data represent a cross-sectional, demographic observation at a single point in time. Census data for 1971, 1976, and 1981 are employed in this study. In contrast, PAS data represent continuous, dynamic observations over an extended period of time, 1971 to 1981/82. This incongruency in the two data sets necessitates the calculation of population estimates for intercensal years 1971-1975 and 1977-1980, under the assumption of a constant rate

(percentage) of population increase, at the district level. These intercensal estimates are subject to some degree of inaccuracy, thus, the population-based rates of hospital utilization are limited within this context.

5) Patient origin-destination analyses are limited to the use of a hospital district as the unit of analysis, rather than a point-specific location. Throughout the province, hospital districts exhibit significant differences with respect to size, population characteristics, means of transportation, and type, number, and location of general hospitals. As a result, patients may exhibit significant variability in the distance travelled to seek hospital care. Due to limitations in the data, this study is not sensitive enough to detect these differences. Collection of point location data is beyond the scope of this investigation.

7) Given that this is a retrospective, longitudinal study employing historic data, responsible application of the research findings to present day is feasible only by taking into account relevant factors, such as, changes in demographic characteristics, system outlay, operation, financing, etc. This is not to understate the value and significance of this study.

1.5 Definitions of Terms

The analytic focus of this study is within the context of the following definitions:

ACUTE CARE - diagnostic and/or short-term treatment-related services/activities provided to inpatients who occupy an acute care hospital bed, (excluding services administered on an outpatient basis).

ACUTE CARE (GENERAL) HOSPITAL - "a hospital which provides primarily for the diagnosis and short-term treatment of patients for a wide range of diseases or injuries" (Alberta Hospitals and Medical Care, 1981/82, p. 66).

AVERAGE LENGTH OF STAY (ALOS) - "the average number of days stay of in-patients who were separated (alive or deceased) from the (acute care hospital) facility during the reporting year. It is calculated by dividing the total days by the number of separations during the reporting year" (Alberta Hospitals and Medical Care, 1981/82, p. 65).

ALOS = total number of patient-days per time (or per district)/ total number of separations per time (or per district)

ELDERLY (THE AGED, GERIATRIC POPULATION) - those persons aged sixty-five years and over.

PATIENT-DAY (PDAY) - "the day, or portion thereof, which an individual spends as an inpatient in a hospital, usually determined by his/her presence in a facility at 2400 hours" (Toll, 1982, p. 13).

PATIENT-DAY RATE (PDAYRATE) - the number of patient-days divided by the number of persons residing in an area.

PATIENT DESTINATION - the acute care hospital to which a patient is admitted.

PATIENT ORIGIN - the hospital district where a patient maintains his/her usual residence.

SEPARATION (SEP) - "the discharge ... of an in-patient" (Alberta Hospitals and Medical Care, 1981/82, p. 66).

SEPARATION RATE (SEPRATE) - the number of separations divided by the number of persons residing in an area.

UTILIZATION - the inpatient use of an acute care hospital, measured in terms of a patient-day, separation, and/or average length of stay.

1.6 Thesis Format

The main text of this thesis is presented in five chapters. In Chapter I, the general scope of the study is introduced, including the study objectives, assumptions, limitations and definitions of terms, and the significance of the study is discussed. Previous research developments and findings related to the study objectives and encompassing concepts and determinants of health services utilization by the general population and by the elderly, as well as research methodology strategies, are reviewed in Chapter II. In Chapter III, the details of the methodology employed and analyses carried out in this study are described. Following, the results are presented in Chapter

IV. Finally, the research findings, major conclusions and recommendations are summarized in Chapter V.

CHAPTER II

A SELECTIVE REVIEW OF THE LITERATURE

The scope of the review of the literature pertinent to the objectives of this study involves a selective overview of the research developments and findings of the following four areas: (1) theoretical concepts related to utilization; (2) societal, health delivery system, and individual determinants of health services utilization; (3) selected aspects of health services utilization by the elderly population, with an emphasis on issues related to demographic utilization trends and long-stay and bed blocking; and (4) patient origin-destination methodologies of relevance to the analysis of acute care hospital utilization patterns.

2.1 Concepts Related to Health Services Utilization

A review of concepts associated with utilization behavior and the health care system facilitates the development of a theoretical research framework for analyzing health services utilization patterns and guides the appropriate interpretation of such results. Health concepts of significance to this study constitute: (1) the societal concept of the health care system; (2) conceptualization from macro-system and micro-system perspectives of health services utilization research; (3) the theoretical relationship between concepts of need,

demand, and utilization; and (4) research approaches employed for the study of utilization behavior. An overview of these concepts is provided in the following subsections.

2.1.1 Concept of the Health System

The concept of the health system is central to health services research, however, researchers are at variance as to the exact nature of its meaning. The vast scope of the health system which includes the medical profession, payment mechanism, medical education and research, health bureaucracies, planning and implementation of health policies, health ideologies, etc., partly accounts for the ambiguity of the definitions. Apparently, the health system appears to be "several things at the same time ... : a system of power relationships, a matter of pressure group politics, a system of social control, a scientific biomedical setting, and a problem of allocation of resources" (De Miguel, 1975, p. 11), all having in common the human being as part of the input, process and output.

Within a broad social and systems context, a health system is regarded as:

> that societal mechanism which transforms generalized resources or inputs (mandate, knowledge, personnel, and resources) into specialized outputs in the form of health services aimed at the health problems of society (Field, 1973, p. 772).

Thus, the foregoing definition views a health system as a specialized subsystem and an aggregate of commitments invested in the health concern of society. Similarly, De

Miguel (1975, p. 13) posits that "A health system is the set of relationships among institutions, social groups and individuals that is directed toward maintaining and improving the health status of a certain human population." From a more specific health resources perspective, a health system is postulated to constitute those " ... personnel and facilities which are organized in order that specialized knowledge and skills can be applied to individuals, ... for purposes of promoting, protecting, or restoring their health" (Bice & White, 1971, p. 253; Weinerman, 1971).

Problems related to defining a health care system, the lack of consensus as to the goal and output of the system, and the influence of numerous factors on the system suggest the inadequacy of research effort in the conceptualization of a health system. A beginning effort in this area is demonstrated by Field (1973) who proposes a macrosociological typology of health systems, distinguishing between the following types: pluralistic, insurance, health services, and socialized. According to this scheme, the Canadian health system is perhaps best described as pluralistic, whereby a variety of institutional schemes (private, public and voluntary) provide health-related services. To some degree, Canada also has an insurance-type health system, making third-party agencies responsible and accountable for financial disbursements to providers of health services. Nevertheless, in the hospital sector, this system characteristic has been somewhat distorted by the

involvement of government.

2.1.2 Macro-System and Micro-System Perspective

Generic to the varying mix of ideology and research conceptualization of utilization behavior is the general alluding reference to a macro-system versus a micro-system perspective of conceptualization. The analytic focus of the macro-system perspective is on health-related socioeconomic factors, on structures and procesess of the health system in relation to the greater social system, and on the association between health institutions and the community (De Miguel, 1975). The macro-system perspective divides health services into two broad categories, public and personal services (Andersen & Anderson, 1979; Anderson, 1963; Macdonald, 1983). Public health services encompass those public programs, such as sanitation, immunization, and water, food and air purification and protection, which are provided for the benefit of the population as a whole. In contrast, personal health services constitute the larger category of services and are comprised of those services received by people as individual patients, including hospital services. Whereas the utilization of personal services must be initiated by the individual, public services may be introduced without active participation of the population.

The micro-system perspective, however, emphasizes individual health behavior and family attitudes, as well as

the role of the medical profession in the utilization of health services (De Miguel, 1975). As depicted by Greenhill and Haythorne (1972) and adapted by Macdonald (1983), the micro-system perspective relates individual determinants of health services utilization to the concepts of need, demand and utilization. Accordingly, through interaction with predisposing, enabling and supply factors, expressed need, demand, and utilization are considered to represent both true and false health care requirements.

2.1.3 Concepts of Need, Demand and Utilization

Information regarding health need, demand and utilization constitutes the basic component of a comprehensive health information system aimed at supporting health policy and planning (Kalimo, 1979a); however, the conceptual and operational differences between need, demand and utilization are often confused and not well understood in the published literature. The interchangeable usage of these terms stems primarily from a lack of comprehension as to the fundamental differences in the phenomena to which these concepts relate to.

Inasmuch as no single accepted concept of need exists in the literature, in particular no single concept of the need for health services (Boulding, 1966), need is viewed from two perspectives, the individual (consumer) versus expert medical opinion (physician). Whereas true medical need, as determined by medical opinion, is considered to be

generated by the incidence of illness for which accepted treatment exists (Feldstein, 1966; Greenhill & Haythorne, 1972), individual perceived need for medical care is synonymous with wants which involve a value judgement based on an individual's psychic perception of his/her health needs (Jeffers, Bognanno, & Bartlett, 1971; MacStravic, 1978). It is postulated that the concept of need involves the maintenance of a homeostatic state (Boulding, 1966), and is influenced by social, cultural, educational, and religious factors. Jeffers, Bognanno, and Bartlett (1971, p. 48) purport that "consumer ignorance" is responsible for the discrepancy between individual wants and true needs.

Health care needs determined by the individual often are not compatible with those defined by expert medical opinion. Whereas the former are equated with subjective wants, the latter constitute,

> that quantity of medical services that expert medical opinion regards as available and necessarily rendered to enable ... to meet contemporary standards of good health (Jeffers, Bognanno, & Bartlett, 1971, p. 50).

Accurate and objective determination of true health needs thus involves perfect knowledge regarding the state of health and the capabilities of modern medicine to improve health, as well as the existence of well-defined standards as to what constitutes health. The absence of such perfect knowledge, in conjunction with the general nature of the definition of health proposed by the World Health Organization (1958), is partly the reason for need being

ambiguously defined as "the difference between the observed and ideal levels of health" (Kalimo, 1979a, p. 64).

To determine the resource needs for maintaining a particular level of health in the population, it becomes necessary to translate information about disease incidence, mortality, and morbidity into quantitative indicators of need for medical care. Kalimo (1979b) has developed such a methodology for estimating a population's average need for medical care.

There exists an apparent consensus in the literature that need plays a major role in determining the demand for health services. Individual perceived needs are transformed into demand for health care and subsequently, medically defined needs, as evaluated by the physician, determine the demand for specific health resources (MacStravic, 1978). Influenced by economic considerations of the price system, demand " ... arises out of consumers attempting to satisfy their psychologically formulated wants" (Jeffers, Bognanno, & Bartlett, 1971, p. 48). Just as need is viewed as a relative and not an absolute concept (Cooper, 1974), the demand for health services is considered to be dynamic, interacting with other factors and changing with time (Feldstein, 1966; Ohmura, 1978). Accordingly, Feldstein (1966) postulates that, while need is generated by the incidence of illness, demand is generated by the inter-relationship of illness with other factors. Price of services, ability to pay, and accessibility are among some

of the enabling factors which influence the nature and the scope of the expressed demand. From a sociological perspective, Boulding (1966) makes the distinction that need is an "equalitarian" concept whereas demand is "libertarian".

Absent in the literature is a clear understanding of the fundamental differences between the concept of demand and utilization. Utilization is generally used to refer to "the actual quantity of services that is consumed when demand is translated into care-seeking behavior" (May & Shortell, 1980, p. 50). Thus, utilization is often equated with observed demand and the two terms are frequently used interchangeably. Conceptually, it is submitted that observed utilization is a function of the interaction of both demand and supply factors (Fuchs, 1968; Hershey, Luft, & Gianaris, 1975; Ohmura, 1978; Scanlon, 1980).

Overall, the literature concedes that, in terms of a causal relationship, health needs generate the demand for medical resources and demand, through interaction with supply factors, leads to the actual use of health services. However, several authors (Cooper, 1974; Jeffers, Bognanno, & Bartlett, 1971) provide a somewhat modified conceptual framework, postulating that individual wants lead to expressed demand for health services, and the demand is evaluated by expert medical opinion and translated into need, which inturn results in utilization. Occasionally in published studies, the relationship between need, demand,

and utilization is reviewed, but frequently, little consideration is given to exactly what is being measured by the data.

2.1.4 Research Approaches

Six analytically distinct approaches or research strategies characterized by the types of independent variables/factors used as determinants of utilization, which have been employed in the literature to explain differences in utilization patterns, include the following: (1) demographic; (2) socio-cultural; (3) social psychological; (4) economic; (5) organizational; and (6) systems approach (Anderson, 1973b; Bice & White, 1969; Gibson, 1972; May & Shortell, 1980; McKinlay, 1972). Each of these research strategies represents an attempt at systematically reducing the broad spectrum of variables affecting utilization behavior into workable form and subsequently placing them into a proper overall perspective.

The *demographic* approach relates utilization to age, sex, marital status, family size, and other related variables in accordance with the premise that these factors represent physiological states of individuals and stages of the family life cycle associated with differences in health status and subsequent utilization of health services (Anderson, 1973a, p. 105). This research strategy is primarily indentifactory in nature and not explanatory in that, the findings do not reveal with any great profundity

why differences in utilization occur.

Inherent in the *socio-cultural* study approach is the emphasis on factors reflecting the physical and social living environment and individual life style which influence the use of services (Gertson, Klauber, Rindflesh, Kan, & Gray, 1975; McKinlay, 1972; Langlie, 1977). Factors concerning social class, ethnicity, education, values, norms, and beliefs are postulated to represent, to some degree, the social pathology of illness and the social networks which exert considerable influence on how illness symptoms are perceived and when and what type of medical care is sought. The socio-cultural approach is limited in considering only selected aspects of social behavior of relevance to the utilization of health services.

The underlying tenet in the *economic* approach to the study of health services utilization is that individuals and families possess certain enabling economic characteristics which permit them to act on a perceived health need regarding the utilization of health services (Aday, 1975). These enabling economic characteristics constitute income, health insurance coverage, financial cost of medical care, and factors related to accessibility to care. Like other research approaches, the economic perspective is limited in scope and can explain only partial differences in utilization patterns. According to this approach, the volume of services consumed is ultimately determined by the interaction of demand and supply factors.

The *organizational* research approach focuses on organizational structure and processes related to the coordination and control of health personnel and of facilities, and examines its effect on utilization behavior (Anderson, 1972; Shortell, Richardson, Loberfo, Diehr, Green, & Weaver, 1977). Included in this approach are variables concerning the organization of physician practices, hospital administrative management style, and professional referral patterns.

By employing input-process-output models, the *systems* approach analyzes utilization behavior within a broader context, incorporating factors covered by all the previous approaches plus outcome variables such as, quality of care and patient satisfaction (Roghmann, Hengst, & Zastowny, 1979; May & Shortell, 1980). The systems approach emphasizes the relationship of structures and the interdependence among factors. Important in this approach is the concept of feedback, which is the effect that processes and/or outputs have on future inputs. Due to its consideration of complex interrelationships which impact health services utilization, the systems approach is beset with difficult measurement and operational problems. Implicit in this approach is the suggestion for the need for a more coordinated effort among policy makers, planners, health care providers and administrators in attempting to modify the health delivery system. Given that the foregoing systems approach is primarily based on an input-output model, it differs

somewhat from Churchman's (1968) systems model which is more concerned with system objectives.

2.1.5 Summary

The literature reflects that well-defined theories delineating the logical relationship among concepts related to health services utilization are at an early stage of development. A basic familiarity with several of the key concepts is, however, required for studying utilization behavior. Although the concept of the health system is central to health services research, researchers are at variance as to the exact nature of its meaning. In general terms, most authors subscribe to the view that a health system is a specialized subsystem and an aggregate of commitments invested in the health concern of society.

Generally, it is submitted that observed utilization is a function of the dynamic interaction of need, demand and supply factors; nevertheless, due to the measurement difficulty and/or the lack of comprehension as to the fundamental differences between need, demand and utilization, these concepts are often used interchangeably. Thus, utilization behavior can be viewed from a macro-system perspective, which relates factors and processes of the health system to the greater social system, or from a micro-system perspective, which relates individual factors to the concepts of need, demand and utilization. It is, therefore, deduced by this investigator that a conceptual

framework of health services utilization, of relevance to this study, must incorporate concepts related to utilization with factors determining utilization behavior. In the course of the development of this model, research developments and findings related to the general determinants of health services utilization are reviewed in the next section.

2.2 Determinants of Health Services Utilization

The utilization of health services appears to be related to and/or determined by a variety of factors. These various factors or determinants are most commonly categorized as: (1) societal determinants; (2) determinants or characteristics of the health delivery system; or (3) individual determinants. Inherent in this broad framework is the inferred relationship that societal determinants of utilization influence individual determinants directly and also indirectly through the health services system (Andersen & Newman, 1973). Notwithstanding the voluminous literature concerning those factors which influence health care utilization, the precise nature of the relationship between these variables and utilization behavior has not been satisfactorily elucidated. However, the basic premise that is maintained in the literature is that an understanding of those determinants associated with utilization behavior facilitates the identification of factors which can be manipulated to improve the provision of and accessibility to health care (Anderson & Aday, 1978; Rosenstock, 1966).

2.2.1 Societal Determinants

Societal factors predominantly influence the environment in which health care utilization occurs and include societal changes in technology and norms. In general, societal factors encompass changes in: (1) definition and treatment of illness, disease trends, and aging related to advances in medical technology; (2) societal norms and expectations regarding the quantity and quality of medical care sought; and (3) demographic characteristics of the population. Accordingly, the health care system and associated patterns of utilization are influenced by changing societal trends (Andersen & Newman, 1973; Field, 1973; Fuchs, 1968).

Rapid advances in medical technology are, in part, responsible for increased hospital utilization, as well as for the changing nature and intensity of medical treatment. Historically, hospitals first undertook a custodial care role; however, with the introduction and development of specialized, sophisticated medical technology, the focus of the hospital has evolved to that of *cure* rather than *care* (Andersen & Newman, 1973). The advent of technological advances in the area of sanitation, immunization and antibiotics has had dramatic impact on the reduction of infant mortality rates, thereby, resulting in a greater proportion of the population surviving to old age and utilizing more health services (Andersen & Newman, 1973).

Russell (1976) concedes that technological change has affected the prolongation of life expectancy and has concomitantly impacted the increased utilization of health care resources and increased chronic and acute care costs. The financial and health care utilization impact of *add-on* technologies which supply added support to existing technologies is considered substantial (Bennett, 1977). Thomas (1977) contends that *half-way* technologies, which are aimed at symptom control and palliation, tend to currently outnumber and exceed in cost *definitive* technologies which are cure-oriented. Technological innovation and proliferation has thus influenced: (1) the near eradication of some diseases; (2) the trend toward earlier diagnosis of other illnesses; and (4) the longer sustenance of life.

Further to technological change, societal norms and values affect the structure and resources of the health care system and the associated utilization patterns. The legislation of the National Health Grants Program, in 1948, in Canada made provision for Hospital Construction Grants for the building of acute care hospitals, which focus on the treatment of illness rather than prevention. Furthermore, the enactment of the Hospital Insurance and Diagnostic Services Act, in 1958, and the Medical Care Act, in 1968, ensured the provision of universal insurance coverage for hospital, physician and other acute care-related health services (Taylor, 1978).

Normative changes in Canadian public attitude regarding the right to reasonable access to health care, as well as comprehensive, universal, and portable health insurance coverage, recently became endorsed by the enactment of the Canada Health Act (1982). Accordingly, past societal norms have largely facilitated the development and utilization of acute care health services rather than preventive and palliative care programs. However, the current focus on constraining health care costs has precipitated a growing emphasis on quality of life, on disease prevention, and palliation of terminal illness.

2.2.2 Health Delivery System Determinants

Research evidence suggests that two broad dimensions of the health delivery system, resources and organization, affect health services utilization behavior. Resources include the labor and capital designated for health care and are analyzed in terms of volume and geographic distribution. Organization refers to what the system does with and how it coordinates its resources for the provision of health care. Of significance to this dimension are issues related to access to and structure of health care delivery, including admission and referral practices, characteristics of hospital care, and the disposition and care of patients following hospitalization (Andersen & Newman, 1973, p. 102).

Of the resources, the supply of acute care hospital beds has long been identified as a major determinant of

hospital utilization; however, research studies differ as to the actual strength of the relationship between this variable and utilization. A natural experiment observation, whereby, a 42 percent increase in hospital bed supply resulted in an 11.8, 20.1, and 5.8 percent increase in admissions, total patient-days, and average length of stay, respectfully, led Roemer (1961) to formulate the health care planning postulate (Roemer's Law) that an increase in the availability of acute care hospital beds generates its own demand, that is, it increases the hospital utilization rate. A path analysis research methodology enabled Harris (1975a) to provide statistical evidence in support of Roemer's Law, noting that: (1) bed supply is strongly associated with hospital admissions and length of stay is indirectly related to hospital census; and (2) an increase in hospital bed supply in metropolitan areas is expected to lead to a greater increase in hospitalization rates than an equivalent increase in the number of beds in rural areas. A positive relationship between hospital bed supply and hospitalization rates is also reported by various other investigators (Anderson, 1973a; Chiswick, 1976; Durbin & Antelman, 1964; Rogatz, 1974; van der Gaag, Rutten, & van Praag, 1975; Wennberg, 1979); however, strong support for Roemer's Law is not unanimous. Brewer and Freedman (1982), for example, do not find a strong relationship between hospital discharges and the availability of acute care beds. Therein, some investigators conclude that the combining effect of the

number of physicians and the supply of hospital beds is a more significant determinant of hospital utilization than the number of acute care beds alone (White, Anderson, Bice, Kalimo, & Schach, 1976).

Research evidence propounds that the rate of hospitalization is strongly, positively correlated with the number of physicians in an area (Wennberg & Gittelsohn, 1982); however, some observations indicate that the addition of extra physicians, above a minimum sufficient level required to meet a service area's needs, will not necessarily increase the total volume of patient-days in the long-run (Kekki, 1980; Weil, 1981). Nevertheless, Harris (1975b) reports that the higher the physician/population ratio the higher the hospital admission rate and the lower the length of stay, with the resultant effect being a net increase in hospital patient-days. Contradictory results are provided by Durbin and Antelman (1964) who explain that, as general physician supply increases more patients tend to be treated without hospitalization, therefore, this has the effect of decreasing the overall admission rate and increasing length of stay, as fewer number of short-stay patients would be admitted.

Not only the supply of physician manpower, but also the type and nature of their medical specialties, influence hospital utilization behavior (Wennberg & Gittelsohn, 1982). Wennberg's (1979) results indicate that the greater the number of surgeons and general practitioners performing

surgery in an area, the higher the hospitalization rate; moreover, the more internists, the more x-rays and diagnostic tests ordered. In general, research evidence implicating the supply of acute care beds and physician manpower as resource determinants of utilization behavior is at variance.

Variables of the organizational component of the health delivery system which are regarded as determinants of utilization are those pertaining to access to and structure of hospital care delivery. Hospital size is shown to be associated with inpatient hospital utilization; however, the posit is maintained that size is correlated with other factors (scope of services, the presence of educational and research programs, and the specialization of medical staff) which also influence hospital utilization patterns (Ro, 1969). Distance and travel time to the hospital are also cited as important determinants of inpatient hospital utilization (Hershey, Luft, & Gianaris, 1975; Shannon, Bashshur, & Metzner, 1969; Weiss & Greenlick, 1970).

2.2.3 Individual Determinants

Much research effort has been devoted to identifying individual determinants of utilization which explain, to some degree, variations in health care utilization patterns. Consistently, most models of utilization focus on individual characteristics or on characteristics of the population at risk; however, the most widely used and accepted model is

the behavior model of health services utilization which emphasizes the sequential operation of conditions pertaining to individual predisposing, enabling, and illness level (need) factors in determining utilization (Andersen, 1968; Andersen & Newman, 1973). Most research findings have been attained and analyzed in terms of this framework (Fiedler, 1981; Kelly & Schieber, 1972; May & Shortell, 1980; Ward, 1977).

Predisposing Factors

Individual predisposing factors, comprising demographic, social structural, and attitudinal belief variables, are assumed to exist prior to the onset of illness and result in differential propensity toward the use of health services. With regard to these factors, various research evidence identifies age as an important determinant of health services and hospital care utilization (Andersen & Hull, 1969; Anderson, 1973a; Kelly & Schieber, 1972; McKinlay, 1972; Nagi & Marsh, 1980), with the ensuing relationship between age and utilization being U-shaped, which is explained, in part, by a corresponding U-shaped relationship between frequency of illness and age (Guzick, 1978). Accordingly, the elderly are reported to utilize health services to a greater extent than younger age groups (Haug, 1981). However, Harris (1975a) suggests that age influences hospital utilization indirectly through hospital size and bed supply. Seemingly, the exact effect of age on the utilization of health services remains equivocal.

An individual's gender evidently confers differential predisposition toward the use of health services. For the general population, females utilize health services, including hospital care, to a greater extent than males, with this difference being largely accounted for by the use of obstetric and gynecological services by women (Anderson, 1973a; McKinlay, 1972). Furthermore, while continuing to enjoy longer life expectancy, females also exhibit higher morbidity rates than males. MacMahon and Puch (1970) suggest that this sex differential in morbidity rates is seemingly a biological phenomenon. The aging of the population is, therefore, expected to result in high demands for and utilization of social and health services by elderly females (Estes, Gerard, & Clarke, 1984). However, Kelly and Schieber (1972) conclude that, conjointly, age, sex, mortality rates and other demographic factors account for a maximum of 15 percent of the observed variation in hospital utilization rates across different segments of a population.

Other predisposing factors which are cited as important determinants of medical care utilization include ethnic composition (Andersen & Newman, 1973), type of occupation (Bice & White, 1969; Fiedler, 1981), lifestyle (Shepard, Corey, Renziand, & Cox, 1983), and individual perception of the seriousness of symptoms (Andersen, 1968; Bice & White, 1969).

McKinlay (1972) submits that individual beliefs may be vaguely related to health care utilization patterns;

however, Andersen and Newman (1973) maintain that individual health values, attitudes towards services, and knowledge about disease play an integral role in the inclination to use such services. Factors concerning values, beliefs, and attitudes present measurement difficulties as they are inherently determined by the complex, simultaneous interaction of a myriad of economic, psychological, and demographic variables.

Enabling Factors

Enabling determinants of utilization act to facilitate or hinder the availability of health services to those who are inclined to seek them and involve both family resources and community characteristics. Measures of family resources include, variables pertaining to income, health insurance coverage, a regular source of health care, and accessibility to health services. Among the enabling conditions of the community which affect utilization patterns are the urban-rural nature of the community and the amount and nature of the health facilities and personnel available. Andersen and Newman (1973) postulate that enabling factors, characteristic of the family and the community, reflect the local norms of medical practice as well as those community values which affect an individual's health care utilization behavior.

Insurance coverage, being both a family resource enabling characteristic and a component of health policy, has been shown to be positively related to health care and

hospital utilization (Aday & Andersen, 1978; Chiswick, 1976). In the United States, the impact of health insurance is reported to have resulted in increased utilization and increased access to medical services, especially for the lowest income groups (Aday & Andersen, 1978; Densen, Jones, Balaruth, & Shapiro, 1960). This phenomenon of increased medical care utilization after the introduction of universal health care insurance has also been exemplified by the Canadian population (Badgely, Hetherington, Matthews, & Schulte, 1967; Enterline, Salter, McDonald, & McDonald, 1973). Furthermore, Aday and Eichorn (1972) note that having a regular (physician) source of medical care serves to significantly influence the increased utilization of such services.

The urban-rural nature of a community is reported to account for geographic variations in utilization patterns and geographic differences in health care expenditures. Residents of urban areas are reported to use more health services when compared to rural residents. From a statistical study of the role of consumer location in the demand for inpatient hospital care, Long (1981) concludes that residential location and urbanization are significant determinants of utilization and that these factors serve as proxy variables for accessibility to services, rather than availability of services. Utilization is often inversely related to distance to health care services/facilities. Contradictory evidence is provided by McKinlay (1972) who

notes that there is little evidence that proximity in itself affects the utilization of health services.

Illness Level (Need) Factors

Illness level factors constitute those factors which directly affect an individual's decision to seek health care. Such factors include and individual's level of disability, tolerance, and a psychological assessment of symptoms (Mechanic, 1962). Due to differences in individual perception of symptoms and needs, the perception of health care need thus becomes critical in determining health services utilization (Hershey, Luft, & Gianaris, 1975).

In a study of families' use of health services, Andersen (1968) found that the need component explained the largest proportion of the variation in the total health services utilization. Accordingly, employing a discriminant analysis model, Nagi and Marsh (1980) found health status and the number of perceived symptoms to be the most significant indicators of the utilization of health services.

2.2.4 Summary

In general, the literature expresses that the utilization of health services is seemingly related to societal factors, factors of the health delivery system, and individual determinants. The precise relationship between these variables and utilization behavior has not been satisfactorily elucidated; nevertheless, the postulate is

maintained that societal determinants influence individual determinants directly and also indirectly through the health services system. Based on this and the previous literature reviewed, this investigator inferred that the macro-system and micro-system perspectives could interlink the concepts of utilization with the foregoing determinants of utilization to produce a fairly comprehensive framework of health services utilization. However, given that the main focus of this study is on the elderly population, the literature findings related to the elderly's use of hospitals must be considered , and are thus reviewed in the next section.

With respect to the more specific research findings, the literature concedes that variations and changes in utilization can be generally attributed to aspects of technology and societal norms, the supply of hospital beds, and other health care resources, and individual predisposing, enabling and need factors, including the urban-rural nature of the community. Cognizant of these general findings, this investigator will now focus (in the next section) on those aspects of relevance to the elderly's use of health services.

2.3 Utilization of Health Services by the Elderly

Since approximately the early 1970s, the literature has been replete with reports related to the elderly's use of health services, particularly the use of acute care hospital beds. In this regard, the studies focus mainly on: (1)

demographic changes in the age structure of the elderly population; (2) characteristic trends in health services utilization by the elderly; (3) factors which may account for variations in utilization; and (4) elderly long-stay hospitalization and bed blocking of acute care beds. A brief overview of the research findings pertaining to these four areas is presented in the following subsections. This review will facilitate the development of an appropriate conceptual framework related to the elderly and the subsequent interpretation of the findings of this study.

2.3.1 Demographic Trends

Characteristically, the most significant feature of projected demographic changes in the age structure of most western industrialized societies is the unprecedented growth in the elderly population, both in absolute number and in relative proportion to the total population. This general aging of the population is attributed to decreasing fertility, decreasing infant mortality rates, and increasing life expectancy (Science Council of Canada, 1976; Statistics Canada, 1979). Estimates indicate that, by the year 2000, almost 400 million of the world's population will be sixty-five years of age and over (Shanas, 1974). By United Nations' standards, a country is old when the sixty-five year and over (the elderly) age group comprises 8 percent of its population; Canada joined this category in 1971 (Ruth & Rudin, 1977).

Census figures available for the last decade reveal that Canada has experienced a relatively rapid increase in the elderly segment of the population. The elderly comprised 8.1 percent (1.7 million) of the total Canadian population in 1971, 8.7 percent (2.0 million) in 1976, and 9.2 percent (2.3 million) in 1981 (Rosenberg, 1983; Statistics Canada, 1979; Stone & Fletcher, 1980). This represents an increase of approximately 35 percent within the last decade. For Canada, the current rapid growth in the elderly population is explained by: (1) the prevalence of relatively high birth rates in the early 1900s and a subsequent overall decline in birth rates; (2) the immigration of approximately 2.6 million individuals between the ages of twenty to thirty-five years, during 1911-1931; at the present time these individuals are aged over sixty-five years; and (3) the significant increase in average life expectancy attributed, in part, to advancements in medical technology and to significant improvements in the standard of living (Statistics Canada, 1979).

Canadian population projections indicate that, by the year 2001, life expectancy will be 71.6 and 80.4 years for males and females, respectively, and that those sixty-five years and older will constitute 12 percent of the total population (Auerbach & Gerber, 1976; Ruth & Rudin, 1977; Schwenger, 1977). Furthermore, it is anticipated that by the year 2031, for the first time in Canadian history, the elderly will outnumber those aged 0-19 years.

In comparison to most other western industrialized nations, Canada continues to have one of the lowest percentages of elderly people. Whereas, in 1976, 8.7 percent of Canada's population was sixty-five years and older, the elderly comprised 15.1, 14.2, 13.6, and 10.7 percent of the total population in Sweden, the United Kingdom, France, and the United States, respectively (Statistics Canada, 1979). Moreover, population projections for the United States indicate that, by the year 2000, approximately 12 percent of the population will be classified as elderly and this relative growth will continue to increase and peak to 18.3 percent in the year 2030 (Russell, 1981; Schwartz, 1982).

Of particular significance in the changing age structure of the population is not only the rapid growth of those aged 65 years and over, but within this group, the proportion of people over 75 years is increasing more rapidly than those 65-69 years (Kovar, 1977; Schwartz, 1982). In light of the demographic trend toward the elderly becoming a more significant group numerically in society, unequivocally, a decreasing proportion of younger people in the labor force will be required to support an increasing proportion of older people. Moreover, the increase in average life expectancy is self-evidently accompanied by an increase in disability and illness in the population.

Supporting the views of most other authors, Korcok (1981, p. 1524) maintains that the " ... accumulation of old people presents one of our greatest social and health care

problems." Roos, Shapiro, and Roos (1984, p. 35) caution that,

> ... the "looming crisis" in health care delivery which is expected from the aging of our population should be rethought. The crisis, if one evolves, may be created by ignoring the real needs of a relatively small number of elderly who are presently using extensive services. Furthermore, this "crisis" may be intensified by the large increase in physician numbers expected during the next decade and by the large amount of physician discretion in determining the services that the elderly and other population groups receive.

Thus, the unprecedented growth in the elderly population calls for a re-thinking of current related social and health care policies.

2.3.2 Hospital Utilization

Research findings consistently reveal that the elderly utilize health services to a greater extent than any other segment of the population, therefore, are the heaviest consumers of health resources. The generally reported finding is that the elderly alone occupy one-third of the hospital beds and account for one-fourth of all health care expenditures (Haug, 1981). In Canada, in 1977, the elderly comprised 9 percent of the total population and consumed 43 percent of all acute care hospital days. Comparatively, in the United States, between 1970 and 1979, the number of inpatient-days increased by 11 percent, of which utilization by the elderly accounted for 94 percent of that increase (Schwartz, 1982). Moreover, Australian data indicate that, whereas the hospital discharge rate for those aged

sixty-five years and over was 37.2 percent, the discharge rate for the 45-64 year age group was 21.8 percent (Hobbs, 1979). Seemingly, the phenomenon of high consumption of health care resources by the elderly is characteristic of most western industrialized nations.

Findings of a longitudinal comparative study of hospital discharge rates in Israel, during 1954-1972, indicate approximately a twofold increase in hospital discharge rates for those sixty-five years and over, as compared to the total population (Halevi & Benbassat, 1982). This study cites the following possible reasons for the observed increase in hospital utilization by the elderly: (1) increased mean age of the population group aged sixty-five and over; (2) health insurance coverage; (3) improved access and transportation to hospital care; and (4) inadequate home care.

Within the elderly segment of the population, the hospitalization rate and the length of hospital stay for the 75 year and over age group tends to be higher than for those 65-74 years (Kovar, 1977). Moreover, hospital utilization by those aged eighty-five years or more is noted to be extremely high (Roos, Shapiro, & Roos, 1984). As confirmed by the findings of Farrow, Rablen and Silver (1976), elderly females account for greater utilization than elderly males. These findings, in conjunction with the observed demographic trends, are expected to produce even higher hospital utilization rates for elderly females in the future. In this

regard, statistical projections by Currie, Smith and Williamson (1979) indicate that, by the year 1991, 59.6 percent of the acute bed-days in Edinburgh may be occupied by females aged seventy-five years and over.

2.3.3 Factors of Utilization

In general, factors which influence hospital utilization patterns by the general population, also tend to affect utilization by the elderly segment of the population. Research findings identify the following variables as being of notable significance in affecting the use of health services by the elderly: (1) age/sex; (2) need; (3) bed supply; and (4) urban-rural community characteristics. A selective overview of the research findings related to the foregoing factors is provided herein.

Age/Sex

Even within the sixty-five year and over age group, age appears to be an important factor in explaining variations in utilization patterns. Age brings with it, "an increase in chronic conditions and physical impairments, mainly in motor and sensory abilities, (which) ... increase significantly in those over age 75" (Engelmann & Stevenson, 1980, p. 6). Thus, the risk of hospitalization is reported to be seemingly greater for the very old (those aged eighty-five years and over) than for the rest of the elderly (Mossey, Havens, Roos, & Shapiro, 1981).

Based on regression analysis results from a health survey, several researchers report that, of the individual predisposing factors studied, only age was shown to have a significant effect on hospital utilization, with younger elders being more likely to report a greater number of hospital days (Branch, Jette, Evashwick, Polansky, Rowe, & Diehr, 1981). The findings of this study contrast those of others which report increasing utilization with increasing age (Kovar, 1977; Roos, Shapiro, & Roos, 1984). The difference in the findings may be attributed to: (1) the interview design methodology employed by the former researchers, which can be biased by age-related factors associated with memory recall; or (2) selectively surveying those elderly who are healthy and the exclusion from study the sick elderly who are in hospitals.

In terms of sex category, some studies indicate that hospital admissions for elderly females tend to be greater than for elderly males; however, once admitted, the length of stay for elderly males is generally lower than that for females (Berg, Browing, Hill, & Wenkert, 1970; Farrow, Rablen, & Silver, 1976). Hodkinson and Hodkinson (1980) confirm these findings by demonstrating that elderly males exhibit a higher rate of mortality than elderly females. Thus, the findings can be interpreted to indicate that the prospects for discharge in the two sexes is due to differences in mortality, rather than to higher prospects of discharge for males; thereby resulting in a longer length of

stay for females. Somewhat contrasting results are provided in the study by van der Gaag, Rutten and van Praag (1975) in that, for very high age groups, male admissions were reported to exceed those of females. Whereas, for elderly males, age was associated with increasing hospital admission rate for both survivors and "decedents" (those dying in hospitals); for females, age apparently only was associated with (increased) hospitalization rates of survivors, but was noted to have negligible effect on the admission rate of female decedents (Shapiro, 1983).

Based on the aforementioned studies, it is evident that age and sex factors influence the elderly's use of health services, however, the exact nature of this impact remains undetermined.

Need

The need for health care is considered to be perhaps the most important factor in the elderly's use of health services. The findings of Wan and Odell (1981) reveal that need is a significant predictor of both hospitalization and the use of physician services. Based on a regression analysis methodology, need characteristics (perceived health status, activity performance, ability to climb stairs and walk one-half mile, and existence of health problems) are reported to account for 12.9 percent of the explained variance in elderly hospital days (Branch, Jette, Evashwick, Polansky, Rowe, & Diehr, 1981). Of the need factors, dependence in daily activities is noted to have the greatest

effect on the reported number of hospital days.

For the elderly, individually perceived need and professionally evaluated need may act to hinder the elderly's use of health services. In that there seems to be a frequent denial of aging, reflected in the unwillingness to label oneself "elderly," awareness of medical need may be suppressed by the older individual and, therefore, much needed care not sought. Moreover, the elderly's psychological capability of the self-assessment of symptoms and level of disability influence perceived need for medical care. From a different perspective, the literature also recognizes that stereotyped orientations of elderly's health needs can limit the delivery of appropriate services. In this regard, Lipman and Sterne (1969) note that assumptions that elderly individuals do not get better, but enter a "terminal sick role," can act as barriers to health services utilization by the aged.

Although it is widely accepted that the need for medical care is one of the most important factors which account for variations in utilization by the elderly, it would appear that different perceptions of this factor may either encourage or hinder the elderly's use of health services.

Bed Supply

Research evidence suggests that the supply of acute care hospital beds may affect elderly hospital utilization levels; however, the exact strength of this influence

remains uncertain. A study of hospital utilization in the Netherlands reports a relatively high admission rate for the elderly segment of the population where there is a high bed supply in general hospitals (van der Gaag, Rutten, & van Praag, 1975). These authors state that, "the high elasticity suggests that the aged may often be hospitalized on the basis of 'social indicators' rather than for essential medical care, when beds are plentiful and demand is low" (van der Gaag, Rutten, & van Praag, 1975, p. 273).

In contrast to the foregoing findings, Wilson (1981) maintains that, for the elderly, demand is inelastic for acute care beds, but more elastic for long-term care beds. As such, the findings obtained by this investigator indicate that the supply of acute care beds has a greater impact on utilization for the less than sixty-five year segment of the hospitalized population. Wilson (1981) reports that, in the population studied, a 10 percent increase in acute care beds increased the elderly medical discharge rate by 2.9 percent and the elderly patient-day rate by 2.2 percent.

The notion that an increasing supply of long-term care beds will reduce the elderly burden on acute care hospital beds has not been substantiated in a Canadian study. Shapiro, Roos and Kavanagh (1980) document that, whereby a major expansion of long-term care rehabilitation beds in Manitoba, from 1971 to 1974, was expected to relieve the pressure on acute care beds by geriatric patients, the ensuing effect was that of fewer patients entering the acute

care hospital, but once there, they were staying longer. Case-mix apparently did not account for the observed effect on length of stay. In contrast, the findings of Wilson (1981) indicate that an increasing supply of long-term care beds has a strong depressing effect on medical length of stay, in that medical elderly patients tend to stay less time in the hospital than would be expected for their case-mix; a 10 percent increase in long-term beds was observed to decrease the elderly patient-day rate by 1 percent. The author concludes that the observed inverse relationship between the supply of long-term beds and the elderly patient-day rate in acute care hospitals represents a substitution effect in operation. It is recommended that since the foregoing relationship may have policy implications, the cost effectiveness of manipulating this relationship deserves further investigation.

Seemingly, studies related to the influence of acute care bed supply on the elderly's utilization of these beds are at variance as to the exact magnitude of the influence of beds on elderly hospitalization.

Urban-Rural Influence

Urban-rural differences in the utilization of health services by the elderly are attributed to differences in community characteristics; as well as differences in culturally determined norms. In a study exploring variations in elderly's hospital utilization by geographic area, Wilson (1981) ascertains that intercommunity differences in

hospital use by the elderly correlate strongly with intercommunity differences in general admission rates. Moreover, it was observed that as community size increases, surgical patient-day and discharge rates increase, while medical discharge rates decrease for the elderly.

A number of dimensions which distinguish urban from rural life are noted to account, to some degree, for observed differences in hospital utilization rates between the two areas (Sygit, 1982). Long (1981) submits that, since a rural population can be expected to be comprised of a greater proportion of males and elderly people, and to exhibit lower per capita income levels than an urban population, it follows that differences in service utilization occur. With respect to physical and technological dimensions, research findings recognize that rural areas are subject to the disadvantages of long distance, less expedient communication and transportation systems, and the lack of urban conveniences. As a result, higher rates of service utilization are reported for urban, rather than rural, areas (Krout, 1983).

Given the aforementioned disadvantages of rural life, the importance of domiciliary and ambulatory care services in rural areas deserves further examination. In a study of health orientations of rural elderly males, Youmans (1967) observes that older men in rural environments tend to: (1) be more concerned about their physical health; (2) report a greater number of health ailments; (3) rate their health

status as worse; and (4) report more role impairments, than elderly urban men. Furthermore, elderly rural men were noted to exhibit poorer mental health and a more pessimistic and negativistic outlook on life. Thus, these research findings suggest that, whereas rural elderly tend to exhibit greater needs for health care services, they tend to utilize the available services to a lower degree.

With reference to the elderly population in Australia Hobbs (1979) submits that, despite the increasing trend toward the movement of some rural elderly into metropolitan areas, the problem of provision of appropriate health services to the rural elderly is likely to increase.

2.3.4 Long-Stay and Bed Blocking

Prolonged hospitalization of the elderly in acute care hospital beds, and the associated problems it creates, has emanated to the forefront of issues pertaining to the elderly's utilization of hospital services. Empirical investigations and discussions in the literature classify this complex issue in terms of long-stay, bed blocking, and misutilization of expensive acute care resources. Generally, it is viewed that long-stay hospitalization and bed blocking by the elderly population conflict with the service delivery role of an acute care hospital and represent a considerable drain on community's health resources. Moreover, prolonged hospitalization may negatively affect both the elderly patient and his/her relationship with family and friends,

and subsequent readjustment to life in the community (Rosenfeld, Goldmann, & Kaprio, 1957). As such, the preponderance and frequency of reportings in the literature related to long-stay and bed blocking reflect the major concern in health services administration and research regarding this issue.

Long-Stay

The literature is replete with reports of unnecessary long-stay hospitalization and misutilization of hospital beds by the elderly population; however, the absence of standard criteria as to what constitutes long-stay makes such studies difficult to compare. Nevertheless, operationally defining long-stay as, that hospitalization which is thirty patient-days or more, is relatively widespread practice; this is in accordance with the American Hospital Association's use of thirty days as the line of demarcation between short-term and long-term hospitals (American Hospital Association, 1955; Rosenfeld, Goldmann, & Kaprio, 1957).

The utilization of approximately one-third of acute care beds by long-stay patients is a figure that is frequently reported in the literature (O'Brien, Joshi, & Warren, 1973; Van Dyke, Brown, & Thom, 1963). Although the actual number of elderly long-stay patients is small relative to the total number of hospital patients, elderly long-stay patients account for a large proportion of the total patient-days; thereby making heavy demands on acute

care resources. An early examination of prolonged hospital stay indicated that only 6 percent of the patients remained in hospital at least thirty days, however, these patients accounted for 32 percent of the total patient-days; persons sixty-five years and older constituted 30 percent of the long-stay patients, compared to 16 percent of those hospitalized for less than thirty days (Rosenfeld, Goldmann, & Kaprio, 1957). Defining long-stay as greater than six months, Hodkinson and Hodkinson (1981) found that elderly long-stay patients occupied an average of 56 percent of all beds in a department of geriatric medicine. As expected, this proportion is significantly higher than the one-third reported for general acute medical wards. According to Hodkinson and Hodkinson (1981), elderly long-stay patients were characteristically female, readmissions, and admitted from old people's homes, nonemergency admissions, or were admitted by transfer. In addition, these patients exhibited physical inactivity prior to admission and presented with lower than average mental test scores. Some degree of intellectual impairment in long-stay patients has also been reported by other investigators (Rainey, Russell, & Silver, 1975). Analysis by disease category reveals that tumors, cardiovascular diseases, and injuries account for approximately 50 percent of the long-stay cases, but for only slightly over 30 percent of those hospitalized for less than thirty days (Rosenfeld, Goldmann, & Kaprio, 1957).

Research results tend to suggest that a large number of elderly long-stay patients occupying acute care beds may not be there for primarily acute medical or nursing care reasons (Currie, Smith, & Williamson, 1979). By means of a 4 score index for predicting a patient's nonmedical hospital stay, it was calculated that, in the group of patients studied, 18 percent of the total inpatient hospital days could be attributed to "social stay," that being the continued hospitalization of patients after the completion of acute medical treatment (Glass, Mulvihill, Smith, Peto, Bucheister, & Stoll, 1977). In their study group, Rosenfeld, Goldmann, and Kaprio (1957) estimated that approximately 56 percent of the long-stay patients were in actual need of active acute hospital care, whereas 42 percent required other types of lower level care. Similarly, McArdle, Wylie, and Alexander (1975) ascertained that 33 percent of the bed-weeks in an acute medical ward were inefficiently utilized by eleven elderly patients who no longer required acute medical care; on average, these patients occupied an acute care bed 1.4 weeks for medical reasons and 14.5 weeks awaiting alternate sources of accommodation. Zimmer (1974) found no need or an uncertain need for hospital care for 11.9 percent of inpatient medical days. Other data seem to indicate that patients whom the physician can keep out of the hospital are those with a relatively long average length of stay (Currie, Smith, & Williamson, 1979; van der Gaag, Rutten, & van Praag, 1975; Van Dyke, Brown, & Thom, 1963).

In a study of the relationship between length of stay and misutilization, Zimmer (1974) shows that the proportion of inappropriate hospital bed utilization increases significantly as length of stay increases, however, the actual number of misutilizations is greater among short-stay cases. Inappropriate admissions or delays in in-hospital procedures account for most short-stay misutilizations, whereas long-stay misutilizations are most frequently ascribed to delays in discharge, primarily to chronic care facilities. Developing hard and fast criteria as to what constitutes misutilization is fraught with difficulty since the best medical treatment is highly case-specific. In this regard, Zimmer and Groomes (1969) caution that misutilization figures based on individual physician-observers thus manifest bias.

Included in the recommendations proposed by Bouchier and Williamson (1982) pertaining to the alleviation of the problem of inappropriate long-stay hospitalization of the elderly in acute care beds is the emphasis on close cooperation between general medicine and geriatric medicine.

Bed Blocking

The problem of the blocked bed generating a back-up of elderly patients in acute care hospitals has emerged as an increasingly salient health care issue. From a health resources perspective, bed blocking refers to the phenomenon arising from long-stay hospitalization and occupancy of an acute care bed. Notwithstanding the implicit understanding

of the term blocked bed by health care providers and administrators, the lack of a conventional, operational definition presents some difficulty in empirical and statistical analysis and evaluation of studies dealing with the utilization of acute care beds by the elderly.

The numerous descriptions and definitions of bed blockage in existence in the medical literature are reflective of the emotive, salient, and controversial nature of this issue. Great Britain was among the first countries to recognize and be affected by bed blockage by the elderly population, with reports indicating that:

> Many of the beds in the formerly voluntary hospital, and in the modernised local authority (acute general) hospital, are being blocked by the presence in the wards of elderly patients who do not require hospital treatment, but cannot return home because of poor home conditions and lack of a home care programme ... (The National Health Service) is being overloaded by having to care for long stay patients who could be more properly dealt with by the local welfare authorities (Hazell, 1976, p. 45-46).

More specifically, a blocked bed has been defined as,

> ... a bed occupied by a patient who in the Consultant's opinion no longer requires the services provided for that bed, but who cannot be discharged or transferred to more suitable accommodation (Hall & Bytheway, 1982, p. 1987).

Employing a patient perspective, Salter (1982, p. 22) describes a bed blocker as " ... a person no longer needing acute medical care, who is delaying admission into the hospital of someone who does." With reference to the same problem, some researchers choose to designate those elderly patients " ... for whom acute care was not needed, but for

whom long-term facilities were not available" as *holdover* patients (Glass, Mulvihill, Smith, Peto, Bucheister, & Stoll, 1977; Shapiro & Roos, 1981, p. 50). Still employing slightly different terminology to describe the same phenomenon, Markson, Steel, and Kane (1983) consider back-up patients as those persons who have been placed on *administratively necessary days*. Furthermore, by operationally formulating the concept of bed blockage in terms of patient characteristics and regarding such patients as *social long-stay* patients, in a selective study of surgical and orthopedic beds, Murphy (1977, p. 1395) observed that elderly bed blocking patients were typically " ... women, over 75, living alone or with one relative, who had been admitted to hospital in emergency with a fractured femur, head injury or other trauma."

In the literature reviewed, most descriptions and representations of bed blocking imply that the concept of blockage is formulated by a particular notion of what an acute care hospital is and does. Furthermore, the association of a particular level of service with a particular hospital bed has bearing upon the recognition of blockage. Hall and Bytheway (1982, p. 1985) submit that the " ... problem is related to a dominant model of acute care in hospitals, which does not accurately reflect the situation of elderly patients or their needs for treatment." Seemingly, bed blocking by the elderly is associated with the division between acute and long-term care and

ultimately, between medical and social problems. However, in the debate over bed blockage, more emphasis is placed on the inefficient use of highly specialized and expensive hospital resources than on patient needs.

Most attempts at conceptualizing the problem of hospital bed blockage by the elderly adopt a systems perspective model which emphasizes input, throughput, and output as measures of productivity. According to this systems analysis of hospitals, the phenomenon of bed blockage arises when regular patient throughput with regard to a particular acute care hospital bed has been stopped, with the resultant rate of output being below the rate of input (Rubin & Davies, 1975). Consequently, this establishes a long-term relationship between the patient and the hospital, in an environmental setting equipped to producing a short-term effect only. Underlying this incompatability between a long-term care involvement in a short-term acute care setting is the difference between cure and care (Mauksch, 1973).

The gradual decline in length of stay for geriatric patients in acute care hospitals over the years implies that geriatrics has, to some degree, adopted the acute model of increasing patient throughput despite large differences in length of stay and illness chronicity between the acute medical and geriatric specialties. Hall and Bytheway (1982) argue that the adoption of an acute model of service delivery to geriatrics is inappropriate and may be at the

expense of neglecting long-term care needs of an increasingly elderly population. Murphy (1977, p. 1396) also advocates this view, stating that:

> It is all too easy to see the blocked-bed problem as a misuse of expensive hospital technology, whereas it is even more a disservice to patients who are misplaced and lacking the attention they need.

In sharp contrast to this statement is Lawrence's (1979) emotive, provocative argument that:

> If a hospital is to function efficiently for the treatment of acute medical and surgical conditions there is no place in it for geriatric medicine; ... Old people must be got out of acute hospitals.

Thus, the stigma attached to the elderly as being undesirable bed blockers stems from the fact that: (1) they are perceived to be less rewarding to treat; (2) they exhibit long length of stay; and (3) medical staff appear to regard alternative long-term institutionalization for younger patients more undesirable, therefore, do not mind keeping younger patients longer (Salter, 1982).

Shortcommings of and inflexibilities in the health care delivery system including inadequate discharge planning, lack of coordination between acute care hospitals and long-term care institutions, limitations in home care programs and insufficient supply of long-term beds are most often cited as the primary reasons for the back-up of chronic, long-stay, elderly patients in acute care beds.

Bed blockage by the elderly is thus recognized to be a system coordination problem that is part of a chain reaction in that, acute medical beds

> ... are blocked by patients who should be in geriatric beds; but these are blocked because there are too few local authority beds to receive patients discharged from geriatric wards (McArdle, Wylie, & Alexander, 1975, p. 569).

Recent Canadian data indicate that many acute care hospitals in Ontario have had 10-20 percent of their active treatment beds blocked by elderly patients awaiting long-term care placement (Paget, 1983). More strikingly, in 1972, the Nova Scotia Council of Health reported that 58 percent of elderly patients over seventy-five years of age were unnecessarily blocking beds, whereas 50 percent of those less than seventy-five years were doing so (Salter, 1982).

Proposed solutions to the problem of bed blockage by the elderly differ markedly, reflecting various authors' perspectives. Attempts at resolving the problem of bed blockage, long-stay and misutilization of acute care beds by the elderly have included the introduction of geriatric consultants to acute medical wards, resulting in a significant reduction in length of stay (Burley, Currie, Smith, & Williamson, 1979). Moreover, the floating-bed concept, wherein the elderly are admitted for two nights every two weeks to the same ward, the same bed, and with the same medical and nursing staff, has had the effect of reducing the number of acute care beds necessary for the elderly, especially for those over seventy-five years (Griffiths & Cosin, 1976; Robertson, Griffiths, & Cosin, 1977). Effective discharge planning and the establishment of a central bed registry are expected to achieve similar

results (Morgan, 1974).

In Canada, Lalonde (1974) recommended the reallocation of existing acute care beds to chronic care. Most recently, however, in a study of geriatric long-stay (greater than ninety days) patients before and after construction of additional long-term beds and expansion of home care programs in Manitoba, Shapiro and Roos (1981) observed that the transfer of long-stay elderly to long-term care facilities took longer after the expansion than before. Thereby, these authors conclude that the building of more long-term care beds to effectively reduce prolonged hospitalization of the elderly in acute care hospitals is not necessarily the most desirable policy alternative.

The experience of Great Britain and other European countries supports the policy perspective that home care programs, in conjunction with adequate community support services, prove to be a better alternative, both financially and as far as the elderly patient is concerned (Portnoi, 1979). An evaluation of the effect of a community-based continuing care program for the disabled elderly in England revealed that elderly patients were maintained in the community at an average cost of 79.5 bed-days per patient per annum - a considerable cost saving when compared to prolonged hospitalization (Robertson, Griffiths, & Cosin, 1977). As such, Skelton (1977) calls for improvements in the health care system to facilitate progressive patient care and prompt transfer to an appropriate level of care.

2.3.5 Summary

The literature pertaining to health services utilization by the elderly is mainly descriptive in nature and reflects that:

1) Projected demographic changes in the age structure of the population, particularly the unprecedented growth in the elderly population, are considered to have major social and health care implications. In as much as the elderly utilize health services to a greater extent than any other segment of the population, including a comparatively high proportion of hospital beds and patient-days, an increase in the elderly population is expected to concomitantly increase their relative consumption of expensive acute care resources.

2) In general, factors which influence hospital utilization by the general population also affect the elderly's use of hospitals. Of these factors, the need for medical care is considered to be perhaps the most important determinant of utilization. Moreover, the supply of hospital beds and the urban-rural nature of the community have been demonstrated to influence utilization, but the extent of this influence remains uncertain.

3) The issue of bed blockage by the elderly population has emanated to the forefront of concerns regarding the elderly's use of acute care hospitals. The writings in this area tend to be emotive and observational and as

such, no empirical definition of bed blockage has been advanced. It appears that the concept of bed blockage is formulated by what an acute care hospital is or does, with the emphasis being on productivity. The incompatibility between long-stay by the elderly in short-stay hospitals results in the drain of a community's expensive acute care resources. In view of the decreasing average length of stay for the elderly in acute care hospitals over the years, some authors argue that the adoption of an acute model to geriatric patients may be inappropriate and may even neglect their real needs for care.

In general, the writings in the literature lack a firm theoretical focus. There has also been a lack of effort in successfully reviewing and incorporating the findings into effective health and social welfare policies that pertain directly to the elderly population. The majority of the studies have been limited to specific hospital wards or to individual hospitals and to short periods of time, and relatively few have adopted a provincial (or area-wide) hospital system perspective. Much needed is a longitudinal study encompassing greater scope.

2.4 Patient Origin-Destination Studies

Research studies indicate that the analysis and quantification of health care-seeking behavior from a geographic, demographic perspective provide valuable

information regarding health care utilization patterns of relevance to facility-specific or area-wide health care planning endeavors. In this regard, patient origin-destination methodologies have been used to quantify patient flow behavior from place of origin (area of residence) to destination of care (facility, hospital). As such, the application of patient origin-destination strategies to the study of health care utilization can facilitate: (1) the examination of patients' health care-seeking patterns by origin and destination; (2) the determination of service (catchment) area and service population; and (3) the comparison of resource utilization from a community-based and a provider-based perspective. Research developments related to the foregoing three aspects of patient origin-destination studies are reviewed in the succeeding sections.

2.4.1 Patient Care-Seeking Patterns

Historically, patient origin-destination analyses of flow patterns in health care-seeking behavior have facilitated the understanding of geographic variations in health services utilization and provided valuable information of relevance to facility and program planning endeavors.

The study of Ciocco and Altenderfer (1945) is considered instrumental in establishing the basic framework for patient origin-destination methodologies. By the

analysis of birth statistics, Ciocco and Altenderfer (1945) quantified the inter-community movement of patients and developed an index to measure the degree of dependency of one county upon the medical facilities of another county. Whereas, the first index, termed the in-residence birth ratio (IR), measured the degree to which residents remained within their home county to receive obstetrical care; the second index, defined as the out-residence birth ratio (OR), ascertained the extent to which residents travelled outside their county of residence to seek obstetrical services. The research findings revealed an increasing IR ratio with increasing per capita hospital bed supply in an area, and with decreasing income level of the population. Based on the results of the interdependence of counties, the authors classified the localities as to the following types: centers, independent, dependent, nonspecific dependent, and partially dependent. Given the degree of movement outside the county of residence, Ciocco and Altenderfer (1945, p. 973) proposed that, "for purposes of comparative analysis, political boundaries should be disregarded and localities regrouped into 'medical trade' areas."

Following the developments of Ciocco and Altenderfer (1945), various other researchers have investigated patterns of health care utilization by means of patient origin-destination analysis. In a patient origin study by Sharp and McCarthy (1971), employing hospital discharge data from mainly rural areas in three northwest American States, the

authors observed that hospitals tended to provide service to the residents within their home area approximately 98 percent of the time. Furthermore, based on the "radial mileage distances" which patients travelled for hospital care, the authors concluded that hospital size was related to travel distance in that, "the smaller the hospital, the shorter the radial distance from within which patients came for care" (Sharp & McCarthy, 1971, p. 839). Moreover, the noted relationship between travel distance and length of stay was that of longer stay for patients who came from further distances. In contrast to the physical distance (space) circle employed by the foregoing authors, Marrinson (1964) proposed that accessibility to health care, as measured by distance, can be more effectively portrayed by a "time circle."

The use of patient origin-destination analysis to study acute care-seeking patterns by the general population (Toll, 1982) and by the pediatric population in Alberta (Romeril, 1984), resulted in the observation of a natural regionalization process which conformed to the phenomenon of distance minimization when seeking hospital services. Earlier reports of the process of regionalization apparent in care-seeking behavior were provided by Gordon, Weldon, and MacLean (1974).

The utility of patient origin-destination studies to investigate the association between distance to facility of care (destination) and other determinants of utilization is

demonstrated in various studies. From an ecological point of view, Bashshur, Shannon, and Metzner (1971) explored the influence of social variables (race, religion, education and income) and distance on patients' health care-seeking patterns. These researchers concluded that there exists a distance range (both in physical and in social space) beyond which individuals are unable or unwilling to travel to obtain medical services.

Morrill and Earickson's (1968) findings indicated that approximately two-thirds of the variation in patient flow patterns could be accounted for by both hospital and community characteristics and the relationships between them. Moreover, Studnicki (1975) reported that, although distance minimization was evident in the patterns of utilization of obstetrical services, organizational factors related to occupancy rate and physician location also played an important role in admission patterns. Employing a patient origin-destination strategy to study nursing home utilization in Alberta, Raasok (1979) noted that organizational characteristics of nursing homes, such as ownership, size and accreditation status, appeared to influence nursing home care-seeking behavior. Similarly, in a study of the utilization of surgical services in Alberta, Macdonald (1983) concluded that travel patterns for surgical care were related to hospital size within a patient's resident area.

Studies employing patient origin-destination techniques to examine health care utilization patterns suggest that care-seeking movement patterns are related to the following determinants of utilization: (1) distance and travel time to care facility; (2) organizational components of the health delivery system; and (3) individual factors.

2.4.2 Service Area and Service Population

The utility of patient origin-destination methodologies for delineating service areas and service populations is well documented in the health services literature. Addressing the problem of developing improved methods for the assessment of the quality of hospital care, based on vital statistics of hospital service area, Lembcke's (1952) study was one of the earliest attempts at defining hospital service areas based on actual hospital utilization for appendectomies. In the methodology employed for calculating the incidence of surgical procedures in various hospital service areas, Lembcke (1952) allocated the surgical event to the area of the patient's usual residence (origin), rather than to the area where the hospital was located. The author acknowledged the utility of this methodology for ascertaining the hospital service area served by one hospital, however, he recognized its inherent shortcomings in the event that an area is served by several hospitals.

Extending the methodology of hospital service area determination from patient origin-destination analysis to

include areas with more than one hospital, Poland and Lembcke (1962) developed "equal-likelihood" service areas. The service area boundaries designated the points of equal-likelihood of patients travelling to one hospital as opposed to all other hospitals.

The foregoing studies concerning the delineation of service areas from origin-destination data were instrumental in instigating the development of Meade's (1974) mathematical model for deriving hospital service areas. Employing patient origin-destination data from primarily rural hospitals, Meade (1974) derived service areas by grouping zip code areas which provided at least 60 percent of its patients to one hospital. Moreover, through the adaptation of a gravity model, the author mathematically replicated and compared patient movement patterns and service areas to those of the raw data. The results indicated a relatively high degree of congruence (96.5 percent) between the patient-origin map and the gravity model map. Nevertheless, the author stated that this technique is suitable for dispersed rural hospitals, with relatively minimal overlap in service areas, but is of limited value for closely clustered urban hospitals.

Of particular relevance to Alberta, Paine and Wilson (1975) assessed acute care bed requirements for six provincial hospital regions by the application of patient origin-destination analysis. The geographic unit of analysis in this study was the census subdivision, in which more than

one hospital may be located. The regional service centers were derived by taking into account the caseload of the area, the presence of adequate transportation access routes, and physician referral patterns, as well as the criterion that 90 percent of the residents remain within their home area to receive care. Moreover, the regional boundaries were determined by patient flow patterns. Teixeira's (1975) review of the foregoing technique of delimiting service areas in Alberta criticized the use of census subdivisions and recommended the use of general hospital districts, whereby, in most cases, one hospital is located within each district.

A natural consequence in the development of the concept of geographic service area is the identification of the accompanying service population. Research developments in this area emphasize the utility of patient origin-destination data in determining service populations, with or without reference to a corresponding geographic service area.

Limitations in the equal-likelihood method of determining service area and service population, especially the insensitivity of the procedure to measure the phenomenon of the " ... continually decreasing tendency to use a given hospital as the distance from it grows" (Griffith, 1972, p. 75), prompted Griffith (1972) to develop two algebraically-defined indices which would quantify this tendency in terms of service population. As such, Griffith

(1972) is credited with the development of the relevance (RI) and commitment (CI) indices. The RI index, measuring the relative tendency of a particular population group to use a particular hospital, was first calculated as "the percentage of total admissions from ... (a particular area) which go to the study hospital" (Griffith, 1972, p. 76). Accordingly, the study hospital's service population is estimated by multiplying the RIs attributed to a particular hospital by the respective population of that area and summing these figures across all areas. By the RI method, the equal-likelihood boundary corresponds to those areas/points where the RI is 50 percent.

The second measure developed by Griffith (1972) for identifying hospital service populations, the commitment (CI) index, measures the degree to which a particular hospital serves different population groups. In this regard, the CI was initially computed as "the percentage of total admissions to the study hospital ... which come from (a particular area) (Griffith, 1972, p. 76).

From a conceptual point of view, Bay and Nestman (1980) refined and generalized the aforementioned methodology of determining hospital service populations. The significant contributions of these investigators include: (1) the demonstration that the "service population of a hospital should and can be defined without direct association with a geographic area" (p. 680); (2) substantiating the utility of the service population model for regional, provincial, or

area-wide (as opposed to single hospital) planning endeavors and for resource allocation mechanisms; (3) generalizing the RI and CI methodology to the use of separations, patient-days, as well as admissions; and (4) the emphasis on various assumptions of homogeneity in the use of RIs and CIs. Application of the proposed model to 1971 Alberta utilization data lead the authors to postulate that the greater variation in the observed resource utilization rates among hospitals, than among districts, may be attributed to physician referral patterns or hospital specialization. As such, further examination of the assumptions of homogeneity is required.

In summary, the research developments related to the use of patient origin-destination data for delineating hospital service areas and service populations indicate an evolving trend toward more sophisticated applications of the methodologies, especially for the derivation of service area. The utility of these methods for assessing resource utilization and allocation is particularly valuable.

2.4.3 Resource Utilization

Patient origin-destination methodologies facilitate the comparison of resource utilization rates among districts (areas) and hospitals by the calculation of comparable per capita utilization rates. The use of population-based rates, which account for health care-seeking travel patterns across service area boundaries, has been advocated by several

researchers (Bay & Nestman, 1980, 1984; Griffith, Restuccia, Tedeschi, Wilson, and Zuckerman, 1981; Shaughnessy, 1982).

The conceptual framework for the derivation of comparable population-based per capita utilization rates from origin-destination data was described by Shaughnessy (1982) in terms of the community-based (CB) and the provider-based perspectives (PB) method. By the CB method, total service utilization by the residents of a geographically-defined area (origin vector) is estimated by summing utilization measures of the residents across also hospitals (destinations) located within or outside the community of residence. The CB per capita rate is then calculated by dividing the total utilization measure of all residents within the area by the (age-sex adjusted) number of persons in the area. Given that the CB utilization measures correspond to the resource consumption of a specified service population, they are inevitably true population-based per capita indicators of resource allocation. Completely objective comparisons of CB utilization rates between areas is only possible if homogeneity of certain area variables among the geographic areas is assumed.

According to the PB method, comparative analysis of resource utilization among different hospitals (providers) is achieved by the delineation of the service population of the provider by the allocation to the provider of "portions of the population from each community served by the

particular provider" (Shaughnessy, 1982, p. 63). The per capita provider resource use measure is subsequently derived by dividing the total utilization for the provider by the estimated service population. In theoretical terms, PB rates may not be considered to be truly population-based, as they do not pertain to an area-specific population group. Nevertheless, PB measures do assess provider performance in per capita units. Inter-hospital (provider) comparison of PB rates should consider differences in provider or service population characteristics.

A review of research applications of patient origin-destination data to assess per capita resource utilization indicates that the CB method is more frequently employed, as compared to the PB method. Wennberg and Gittelsohn (1973) employed the CB method of per capita rate calculation to study the variability in resource utilization among small geographic areas in the state of Vermont. Moreover, the same methodology was applied by these authors, some years later, to investigate variations in age-sex adjusted surgical utilization rates among the six states of New England (Wennberg and Gittelsohn, 1982). The findings of this study demonstrated a strong relationship between area-specific utilization of surgical resources and the number of surgeons, as well as the per capita supply of hospital beds, in the area. The utility of the CB method for assessing regional variations in surgical utilization in Alberta has also been demonstrated by Macdonald (1983).

Moreover, Romeril (1984) employed this methodology to effect trend analysis of regional variations in pediatric utilization rates in the province.

Although studies employing the PB method of calculating per capita utilization measures have been fewer in number, the findings have proven to be of valuable importance. Griffith (1978) computed various PB per capita measures to evaluate hospital performance in terms of cost and the quantity and quality of services provided. A similar study was carried out to measure community hospital performance in Michigan (Griffith, Restuccia, Tedeschi, Wilson, & Zuckerman, 1981). An external review of this work emphasized its value in demonstrating that "population-based evaluation data can be assembled on individual hospital and 'hospital cluster' bases from readily available sources" (Sigmond, 1981, p. 162). Nevertheless, the study was criticized for adopting a "narrow noncomprehensive nonregional perspective on hospital planning" (p. 163). Griffith, Restuccia, Tedeschi, Wilson and Zuckerman (1981) also identified the inherent methodological limitation of the lack of adjustment for differences in case-mix complexities among hospitals.

The foregoing review of studies employing population-based per capita rates of health resource utilization and consumption emphasizes the value of CB and PB methods for the analysis and objective comparison of utilization rates, and for the evaluation of per capita resource allocation. As such, the utility of the

methodologies for health care planning endeavors was demonstrated.

2.4.4 Summary

Research findings and developments indicate that patient-origin methodologies may be employed to:

1) quantify health care-seeking flow patterns and to examine geographic variations in the utilization of health services. Based on this application, the reported findings suggest that health care-seeking travel patterns may be related to distance and travel time factors, to the organizational components of the health system, physician practice patterns, and/or to individual and social factors;
2) delineate service population without direct association to a geographic area. The formulation of the RI and CI by Griffith (1972) and refinement and generalization of this method by Bay and Nestman (1980) represent the most notable developments in this area; and
3) effect the comparison of per capita resource allocation either from a CB or a PB perspective.

Based on the foregoing applications, patient origin-destination analyses are deemed particularly availing for area-wide health system planning and evaluation. Of relevance to the objectives of this study, patient origin-destination analyses are seemingly appropriate to the examination of care-seeking movement patterns by the elderly

throughout the province.

2.5 Literature Review Summary

In general, the literature reviewed, of relevance to the objectives of this study, indicated that:

1) The scope of the research in the area of health services utilization is still exploratory in nature; and as such, no real hypothesis-testing systematic analyses have been attempted. In this regard, well-defined theories delineating the logical relationship among concepts of health services utilization are at an early stage of development. Most generic models of utilization tend, however, to incorporate the concepts of need, demand and utilization with societal, health delivery system and individual determinants of utilization. Conceptual models specific to the elderly population have not been developed, as those models which explain utilization by other age groups, also are deemed appropriate for the elderly.

2) Variations in patterns of health services utilization by the general population and by the elderly, tend to be explained by differences in societal, health delivery system and individual factors. The literature *about* these determinants of utilization tends to be more substantial than the findings themselves. In this regard, most researchers tend to investigate, for example, the impact of technology, bed supply, supply

of physician manpower, distance and travel time, or income, on the utilization of health services. It would appear that the operative influence of several factors in combination may best account for variations in utilization patterns.

3) Although the literature is replete with descriptive accounts of the utilization of hospitals by the elderly population, the findings tend to confirm observations, rather than provide new insight. The elderly's use of hospitals tends to be associated with age, geographic parameters, bed supply, as well as various other factors. Most studies of these factors are limited to small time periods or to one hospital. Lacking is a longitudinal study based on an area-wide hospital system.

4) Writings related to long-stay in and bed blockage of acute care beds by the elderly dominate the literature pertaining to the elderly's use of hospitals. However, these writings are primarily emotive in nature, expressing different authors' viewpoints.

5) The utility of patient origin-destination methodologies for quantifying health care-seeking patterns and delineating service areas and service populations are particularly suitable to the objectives of this study, for the examination of demographic and geographic variations in the elderly's use of acute care hospitals.

CHAPTER III

METHODOLOGY

The purpose of this study was, primarily, to analyze trends and variations in demographic and geographic patterns of utilization of short-term, general, acute care hospitals by the elderly population in Alberta and, secondarily, to compare these rates and patterns of utilization to those of the nonelderly, general population in the province. The research process undertaken to achieve and operationalize the foregoing purpose and the associated study objectives translated into the following three investigational phases: (1) formulation of a general theoretical framework and research strategy; (2) selection, acquisition, and development of appropriate data and data files; and (3) identification, development, and execution of relevant data analysis strategies. A detailed discussion of the three phases of the research methodology employed in this study is provided in the sections which follow.

3.1 Conceptual Framework and Research Strategy

The first phase of this project involved defining the study purpose and objectives in terms of a general research design which would guide subsequent data analysis steps. This included the development of a conceptual framework and a general research strategy of relevance to the study of utilization patterns of acute care hospitals by the elderly.

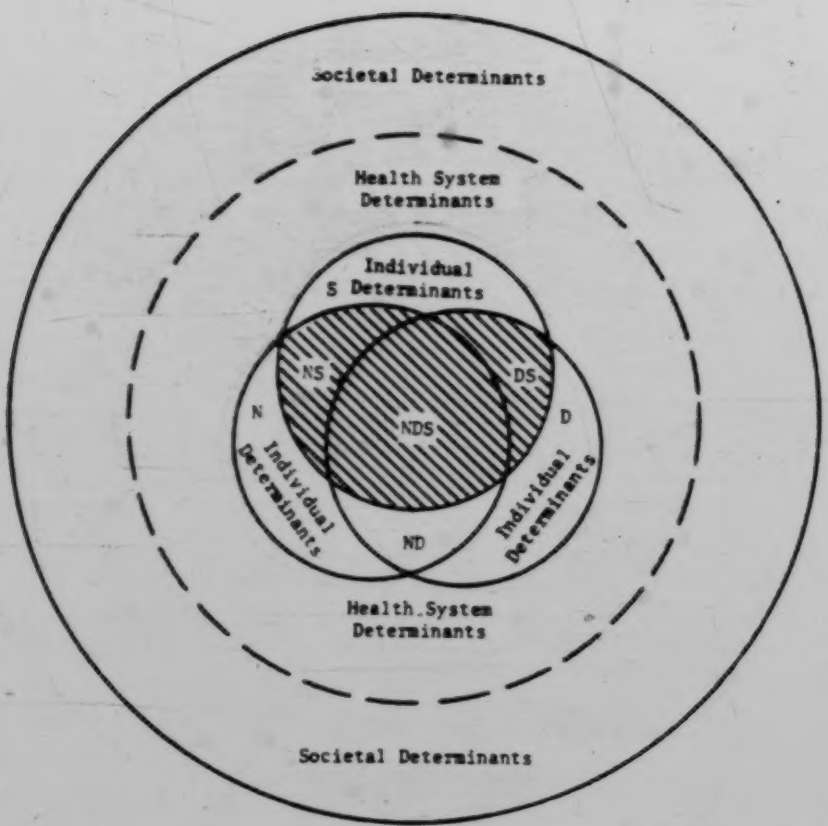
3.1.1 Conceptual Framework

In order that this study be placed into proper research perspective in relation to health services utilization, in general, and acute care hospital utilization, in particular, and to facilitate interpretation of study findings, the formulation of a conceptual framework was considered fundamental to the research process undertaken. A selective review of the literature pertaining to concepts and conceptual models of health services utilization, determinants of utilization, and empirical findings regarding health services utilization, by the general population and by the elderly, provided the basis for the development of such a theoretical framework. Based on the literature reviewed, the results of which were presented in Chapter II, the conceptual model which was employed for this study is schematically illustrated in Figure 1.

Several research sources, addressing both general and specific health services utilization behavior and utilization by the elderly in particular, contributed to the development of the conceptual framework. The model, as depicted in Figure 1, attempted to integrate the social systems perspective (Andersen & Newman, 1973) with the consumer market view of utilization (Jeffers, Bognanno, & Bartlett, 1971) in both a macro-system and a micro-system perspective of conceptualization. Furthermore, the model attempted to illustrate the inter-relationship between three levels of determinants of utilization (societal, health

Figure 1

Conceptual Model of Health Services Utilization by the Elderly*



NDS - True needs, demanded and served
NS - True needs, not demanded but served
DS - False needs, demanded and served (abuse)
ND - True needs, demanded but not served (access problem)
N - True needs, not demanded, not served
D - False needs, demanded but not served
S - Service available but not used (waste of resources)

*Adapted from Romeril, 1984

delivery system, and individual) and three concepts of utilization behavior (need, demand, and supply). Whereas the macro-system perspective portrayed the association between the health system and the greater social system (represented as the shaded area in Figure 1), the micro-system perspective emphasized the relationship between the individual and the health system in the utilization of health services.

According to this model, societal determinants affect individual determinants, directly and indirectly through the health services system. Moreover, the association between individual determinants and factors of need, demand and supply result in the utilization of health services.

Overall, the conceptual model was purposefully not intended to indicate any direct causal relationships but to represent the complex and dynamic interaction between determinants of utilization in producing actual utilization behavior.

This model closely resembles the utilization model employed by Romeril (1984) for the study of pediatric utilization in Alberta. The general nature of the model and its illustration that actual utilization measures represent true needs demanded and served, true needs not demanded but served, and false needs demanded and served (misutilization), made this model particularly appropriate for the study of the utilization of acute care hospitals by the elderly population.

3.1.2 General Research Strategy

The selection of a research strategy that would be consistent with the general study purpose and objectives was regarded of utmost importance in enhancing the utility of this research study. Given the scope of the research objectives of this study and the conceptual model, as well as the nature of the research developments and findings published in the literature, a research approach of an exploratory, descriptive, retrospective, longitudinal, comparative, and population-based nature was determined to be the most appropriate. The justification for employing this general research strategy is outlined in the ensuing paragraphs.

Research, in general, is viewed as a cyclical process - beginning with observations, progressing through theories and predictions, and returning to new observations; thereby, completing one research cycle and beginning the next. Within this process, the research developments pertaining to utilization behavior are mainly observational and, as such, well-defined theories are at an early stage of development. Accordingly, the lack of well-established theoretical research foundations on which to base hypotheses precluded the use of a confirmatory research perspective which is applied to the study of causal relationships among variables by way of experimentation. The retrospective nature of the PAS data employed for this study restricted the use of an analytic, inferential research strategy which ideally

requires prospective data. Furthermore, since a province-wide population-based analysis was intended and since the study objectives of this project were primarily descriptive in nature, an inferential research approach, which employs a sampling methodology, was deemed unnecessary and somewhat inappropriate. Thus, an exploratory, descriptive research strategy was adopted with the view of identifying and documenting selected aspects of the elderly's use of acute care hospitals in the province.

To examine patterns of acute care hospital utilization by the elderly over a period of time, a trend analysis design, employing longitudinal data, was selected. An eleven year study period was employed. Despite some drawbacks, such retrospective data were deemed most appropriate in terms of being readily available and accessible and relatively inexpensive to obtain for this study. A prospective research approach and data collection methodology was beyond the scope and the resources of this investigation. Moreover, a cross-sectional research design, employing data collected at a particular point in time, was clearly incompatible with the trend analysis research objectives of this study.

The study objectives related to obtaining information for health care planning in Alberta encompassed issues pertaining to epidemiological, demographic trends and the allocation of scarce health care resources. A comparative, population-based research approach, employing per capita measures, effected the analysis and comparability of

variations in utilization behavior between different geographic regions in the province, as well as between the elderly and the rest of the population. Per capita measures somewhat compensated for methodological limitations of raw utilization data which were associated with the impact of supply on utilization and the unrestrained movement of patients across hospital district boundaries (Bay & Nestman, 1984).

A community-based (CB) method, based on the population of defined geographic regions (regardless of the location of the provider), was employed for the calculation of per capita utilization measures (Shaughnessy, 1982). Thus, the analysis of variations in hospital utilization between different hospital districts/regions was achieved by the CB method. Due to the uncertainty about the validity of the methodology, as well as the necessity for various homogeneity assumptions, the provider-based (PB) method of calculating per capita utilization measures was not used. The difficulty of ascertaining the service population of a particular hospital or hospital group made the PB method unnecessarily complex and with minimal added benefit for this study.

Comparison of per capita utilization rates between the elderly and nonelderly segments of the population did not require age-sex adjustment as the intent was to ascertain differences in utilization rates due to age. Nevertheless, to ensure comparability of the elderly's utilization rates

over time and between different regions of the province, population age-sex adjustment was applied to all other per capita rate measures.

In summary, the general research strategy used in this study of patterns of acute care hospital utilization by the elderly in Alberta included:

1) an exploratory, descriptive approach reflecting the absence of well-defined theories of geriatric hospital utilization and consistent with a province-wide population-based analysis;
2) a trend analysis strategy employing longitudinal, retrospective data, rather than prospective data, and spanning an eleven year study period;
3) a patient origin-destination analysis to examine geriatric hospital care-seeking flow patterns from a CB and a PB perspective; and
4) a comparative, population-based perspective, facilitated by the calculation of age-sex adjusted utilization rates (for comparison between regions and/or over time) and comparison of the elderly's utilization experience to that of the rest of the population.

The overall research strategy was complementary to the type of data available for analysis and the strategy also emphasized the overall intent of this study being the generation of information pertinent to geriatric health care planning and policy development in the province.

3.2 Data Sources

In accordance with the research design effort to maintain some degree of complementarity between the health system planning thrusts of this study, and the data sources used and the epidemiological, demographic study focus, federal and provincial hospital utilization data were employed. These data were of three types: (1) federal census data; (2) Professional Activity Study (PAS) data; and (3) provincial annual reports. Such routinely collected data are readily accessible to health care planners, policy makers and administrators, thus, the intent was to assess the utility of such data as sources of information for health care planning and administrative decision making. Moreover, the relative ease of accessibility to such data for research purposes and the financial and time restrictions placed on this study favored the use of the foregoing sources of data.

3.2.1 Census Data

To operationalize the population-based research strategy of the investigation undertaken, federally collected census data were employed in the calculation of per capita hospital utilization rates. The census data represent a cross-sectional demographic observation of the population at a single point in time, specifically June 1st of a given census year. While census data represent the most accurate account available of the enumeration of the population at a particular time, they are static

observations and may underestimate the population by as much as 5 percent. Such limitations in the census data were assumed to have minimal impact on the final results.

The smallest geographic unit of census data collected and published by Statistics Canada was the enumeration area (EA), which normally did not cross a geo-political boundary. The aggregation of EAs, by the provincial government, facilitated the calculation of census figures for a geographically defined area within a political or natural boundary, such as a hospital district. The methodology employed by the provincial government in the computation of census figures for hospital districts specified that, where boundaries between hospital districts divided an EA between two or more districts, the EA was allocated entirely into one or another hospital district according to: (1) the proportion of the geographic EA located in one district as opposed to another; (2) the proximity of the nearest urbanized area where the EA falls equally into the districts involved; (3) trade-offs of two EAs of approximately equal geographic area, falling equally into the same two hospital districts; and (4) population growth considerations, where the foregoing criteria could not clearly determine allocation. By mere definition of the EA, the foregoing exercise was not performed too frequently. Thus, the Alberta census data acquired for this study were for census years 1971, 1976 and 1981 and were tabulated according to sex, 5-year age categories and 103 hospital districts.

Census Data Modifications

The incongruency between the cross-sectional census data for years 1971, 1976 and 1981 and the continuous time flow data for patient separations for 1971 to 1981/82, necessitated the calculation of population estimates for intercensal years 1972-1975 and 1977-1980, inclusive. The exponential population growth model, founded on the assumption of a constant rate (percentage) of population increase, was considered to portray a more realistic pattern of growth and was thus selected as the method of choice for these calculations. A more detailed account of the actual formulae employed in the calculation of population estimates is provided in Appendix A1.

Other population estimate models were considered but were ultimately disregarded. The linear population estimate model, with the assumption of a constant absolute (arithmetic) yearly population increase, or decrease, was deemed too simplistic and somewhat inappropriate in view of the fact that population growth is affected by rates of fertility, mortality, internal migration, and external migration. Component methods, employing age-specific birth, death, immigration and emigration information, and symptomatic, vital rates methods were excluded on the basis that such information was not available for the hospital districts. In order to statistically adjust for the confounding effect of variations in age and sex distribution across the population, and thus to effect unbiased

comparisons of utilization rates, the census data were age-sex standardized via the indirect method. By the indirect method of standardization, the more constant rates of the larger provincial population were applied to the smaller hospital district groups (Mausner & Bahn, 1979). Moreover, this adjustment was computed by the weighted-sum approach (Bay & Nestman, 1980). By the weighted-sum approach of the indirect method of population age-sex standardization, the calculated, adjusted population figure depicted relative, comparable person units and not actual number of persons. Appendix A2 provides further details regarding the weighted-sum methodology of population age-sex adjustment employed in this study. The direct method of standardization, which involves the application of age-sex specific rates of the study populations to those of an arbitrarily chosen standard population, was considered unnecessarily complex for the purpose of this study.

3.2.2 Professional Activity Study (PAS) Data

The provincial Department of Hospitals and Medical Care supplied the primary source of utilization data, in the form of computerized PAS separation abstracts, for all acute care hospitals in the province for the period January 1, 1971 to March 31, 1982. A PAS separation abstract constitutes a hospital discharge summary which contains coded patient demographic, diagnostic and treatment data. The data for the PAS separation abstracts were routinely collected and

compiled, in accordance with the definitions and criteria established by the Commission on Professional and Hospital Activities (CPHA).

Several inherent advantages existed in using PAS data. The ready availability of a large, complete population data base, which represents the entire utilization experience of the hospital system in the province, was considered valuable. Moreover, assurance of data objectivity and reliability stemmed from CPHA's voluntary and nonprofit status, as well as from a data collection methodology that is unbiased by government, reimbursement mechanisms or special interest groups.

The use of the hospital separation episode, rather than the individual patient, as the unit of PAS data collection was postulated to affect the research analysis twofold. Firstly, in view of the fact that patients may be admitted several times for the same illness and that, should hospital transfers occur, more than one separation abstract would be generated for the same patient, the use of the separation as the unit of analysis could bias utilization rates toward over-representation of the actual number of cases (patients). To assess and compensate for this limitation, analyses were conducted using patient-days (PDAYS), as well as separations (SEPS). The PDAY measure was also considered to be relatively more homogeneous with respect to resource requirements and service demand, as compared with the SEP measure. However, the use of PDAYS was also not without

limitation. Based on the pre-established practice of according the SEP to the year in which the SEP occurred, regardless of the year of admission, some inherent distortions in the PDAYS were possible. Nevertheless, since it was assumed that such recording would be nonsystematic and that separations occur at random, the impact of this limitation was considered minimal in that it would produce a cancelling-out effect.

Secondly, since the unit of PAS data represents a SEP episode, rather than a patient, an analysis of actual patient flow patterns, i.e. patterns of hospitalization regarding one episode of illness or one patient, was not possible. Such an analysis was, furthermore, restricted by the confidentiality aspect of removing patient identification numbers (Alberta Health Care Insurance Plan numbers) prior to the release of the computerized files by the Department of Hospitals and Medical Care. Thus, the origin-destination analyses undertaken in this study reflect hospital care-seeking patterns only, and are not intended to portray individual patient movement patterns throughout the hospital system in the province.

For conceptual and analytic purposes, Alberta was considered as having a closed acute care hospital system, thus, the scope of the analysis was limited to Alberta residents only. Data on hospital utilization in Alberta by nonresidents were available, however, complementary data on residents seeking inpatient hospital care outside the

province were not readily accessible. As a result, the exclusion of nonresidents seeking hospital care in Alberta and Alberta residents seeking hospital care outside the province was assumed to not sigificantly compromise the study.

The characteristic continuous time flow element of the PAS data set was somewhat compromised by the absence of three months of data for 1979. To compensate for this limitation and to restore the continuous twelve month analytic period, beginning for April 1979 the calendar year was transmuted to span April 1979 to March 1980, subsequently April 1980 to March 1981, and finally April 1981 to March 1982. This simpler adjustment of restoring longitudinal data comparability was more favored than the more complex method of applying a series of adjustment factors to the data.

The use of two time-incompatible data sets in the calculation of utilization rates was a noted limitation of the study. Whereas PAS data are continuous and dynamic, census data represent a cross-sectional demographic observation at a specific point in time. Such discrepancies in the data sets were postulated to somewhat affect the validity of the calculated utilization rates, however, the actual impact was considered minimal.

PAS Data Variables

The operationalization of the study objectives necessitated the use of the following key variables from the

PAS data file: (1) patient age at the date of admission; (2) year of separation from the hospital; (3) identification code of the admitting hospital; and (4) hospital district code coinciding with the patient's permanent residence.

The demographic focus of this study concentrated on hospital utilization by age. Age was regarded as a predisposing condition in that, it was not considered to be a reason for seeking health care, but rather different age groups manifest different types and amounts of illnesses, thus resulting in different patterns of hospital utilization. Age sixty-five was employed to designate the lower age limit for the elderly segment of the population. As there seem to be no biological reasons for defining the beginning of old age in terms of a specified calendar age, the reasons for using age sixty-five to mark this beginning were primarily social and legislative. At present, age sixty-five is widely accepted as the age for retirement from the work force and the qualifying age for health and social welfare programs related to aging. The elderly population was further subdivided into the following 5-year age categories: (1) 65-69 years; (2) 70-74 years; and (3) 75 years and over. This breakdown corresponded to the census age categories, as well as to the classification scheme used in numerous other research publications.

The significance of employing the study period 1971-1981/82 was twofold: (1) beginning in 1971, the health care system in Alberta had in place one year of complete

health care insurance coverage and it was approximately during this period that the utilization of hospital beds by the elderly began to emerge as a demographic and a health care issue; and (2) PAS data were available beginning for January 1971 and ending most recently for March 1982.

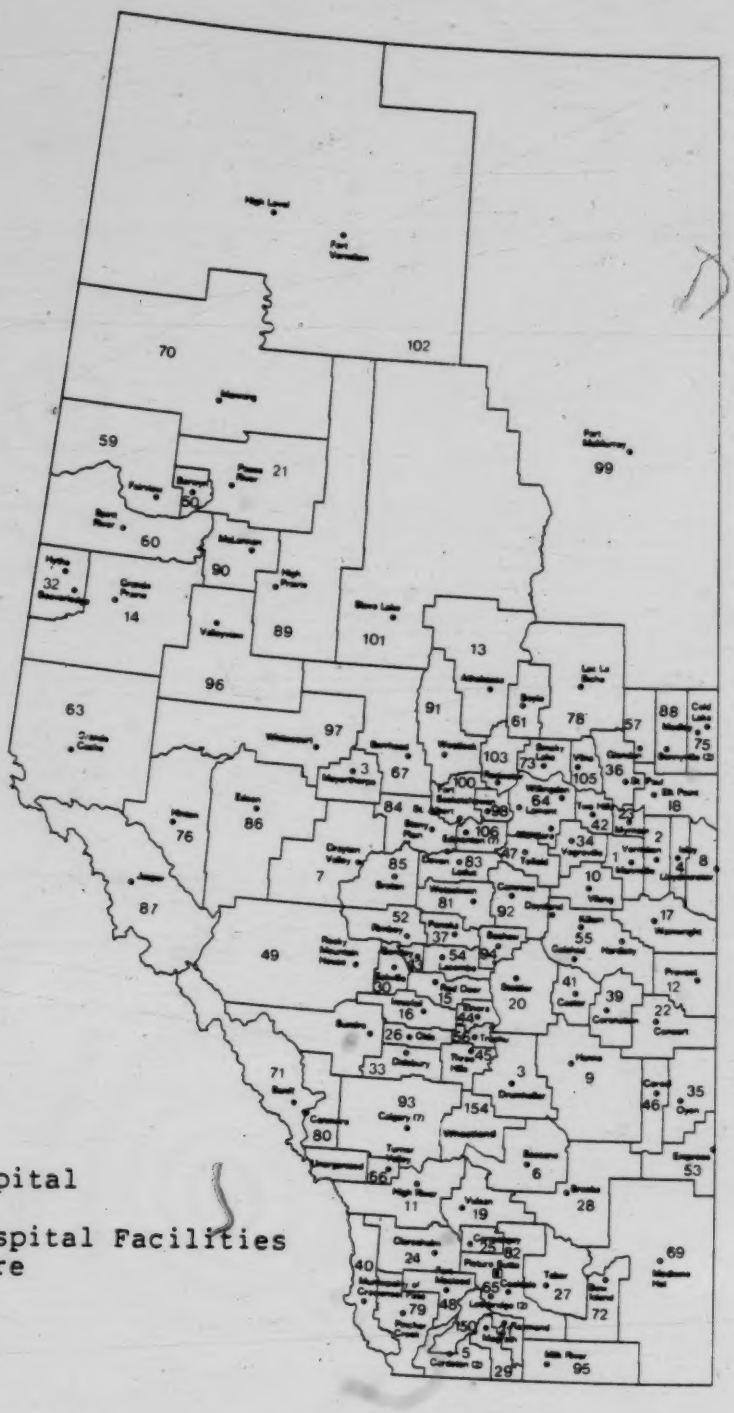
The hospital district variable consisted of 103 mutually exclusive and exhaustive geographic units (listed in Appendix A3 and illustrated in Figure 2) with all but eight districts containing only one hospital. The districts which contained greater than one hospital included: (1) District 32 (Beaverlodge-Hythe) - 2 hospitals; (2) District 55 (Flagstaff-Hughenden) - 4 hospitals; (3) District 64 (Lamont-Mundare-Willingdon) - 3 hospitals; (4) District 65 (Lethbridge) - 3 hospitals; (5)-District 88 (Bonnyville) - 2 hospitals; (6) District 93 (Metro-Calgary) - 6 hospitals; (7) District 102 (Fort Vermilion) - 2 hospitals; and (8) District 106 (Metro-Edmonton) - 6 hospitals.

3.2.3 Provincial Annual Reports

Annual reports compiled by the Department of Hospitals and Medical Care provided the data source for descriptive statistics regarding selected aspects of the hospital system in the province. Such reports were available for the years 1971 to 1981/82 inclusive. The supporting information from these reports of relevance to this study included the yearly acute care, long-term care, and nursing home rated bed capacity, in addition to the corresponding per capita bed

Figure 2

Configuration of General Hospital Districts in Alberta



. General Hospital

(2) Multiple Hospital Facilities in One Centre

supply figures.

By way of background information, from April 1971 through December 1977, the provincial administrative body for Alberta hospitals was the Alberta Hospital Services Commission; however, effective January 1978, this responsibility was transferred to the newly established Department of Hospitals and Medical Care.

3.3 Data Analysis Strategies

The main research objectives of this study focused on the analysis of demographic and geographic patterns of utilization of Alberta's acute care hospitals by the elderly and the comparison of these rates and patterns of utilization to those of the general, nonelderly population in the province. This research focus was systematically operationalized by the following sequence of data analysis strategies: (1) an overall provincial analysis of the trends in the rates and patterns of hospital utilization of the elderly and nonelderly segments of the population over time (1971 to 1981/82); (2) a hospital district analysis of the hospital utilization rates by the elderly; (3) a trend analysis of acute care hospital utilization rates and patterns by the elderly from a regional, geographic perspective; and (4) an investigation of hospital care-seeking patterns by the elderly over time, by way of patient origin-destination analysis.

Inherent in the data analysis strategies employed were the variables of time and geographic location, thereby reflecting a dynamic health system research and planning focus. It was postulated that location acts as a proxy for accessibility and/or for socio-demographic characteristics and health status. Moreover, the time variable facilitated the investigation of changes in health care and resource use and health status over an extended period.

All data analytic steps were performed by employing SPSSX (Statistical Package for the Social Sciences) (SPSSX Inc., 1983), except for initial tabulations of PAS data by age, sex, hospitals, and districts which were carried out using special programs written in FORTRAN. Each of the data analysis strategies are described in greater detail in the sections following.

3.3.1 Provincial Analysis

A macro-system research focus in the form of an overall provincial analysis constituted the first step in the systematic sequence of data analytic strategies. The intent of the provincial analysis was to examine and describe the hospital utilization behavior of the broader, acute care, provincial hospital system, as well as to monitor trends over time. Moreover, the objective was to compare and contrast age-related differences in hospital utilization rates between the elderly and nonelderly segments of the population in Alberta.

Methodologically, the provincial analysis involved the aggregation of utilization data (total SEPS, total PDAYS, and ALOS) over all hospitals and all hospital districts in the province. These data were examined for each of the years (1971,1972,...1981/82) and for all years combined (1971-1981/82). Furthermore, the analysis was performed for the entire Alberta population (elderly plus nonelderly), as well as for the elderly and nonelderly separately.

Provincial utilization rates were calculated by including either total provincial SEPS or total provincial PDAYS in the numerator, and actual or estimated provincial census population figures in the denominator.

3.3.2 Hospital District Analysis

From a systems planning and resource allocation perspective, the Alberta hospital system is comprised of numerous mutually exclusive and exhaustive geographic regions or service areas designated as hospital districts. An analysis of interdistrict variation in hospital utilization rates was effected by a hospital district analysis employing a community-based service population methodology and per capita utilization measurements (Bay & Nestman, 1984; Griffith, Restuccia, Tedeschi, Wilson, & Zuckerman, 1981; Shaughnessy, 1982).

The use of the hospital district as the geographic unit of analysis necessitated the assumption of a closed hospital system and a community hospital concept, whereby, one

hospital serves one geographic area (hospital district). Moreover, the community-based method was subjected to the assumption of relative homogeneity of the smaller areas within the larger hospital district with respect to factors which influence hospital utilization. Nevertheless, hospital districts in the province do exhibit differences with respect to size, population characteristics, means of transportation, and type, number and location of general hospitals. Interdistrict comparisons of utilization rates was thus facilitated by the calculation of district per capita measurements.

Analytically, the hospital district analysis was performed for 103 hospital districts and for all years combined, using elderly SEPS, PDAYS and ALOS as the utilization measures.

3.3.3 Regional Analysis

An analysis of hospital utilization rates for a series of different provincial regions was conducted in order to investigate the possible existence of variations in hospital utilization rates according to broad geographic areas having similar or dissimilar characteristic features. The results of the patient origin-destination analyses, as well as findings of other regional analysis studies conducted in Alberta (Macdonald, 1983; Paine & Wilson, 1975; Romeril, 1984; Toll, 1982) provided the basis for the clustering or hospital district aggregation strategies employed in this

study. Accordingly, hospital districts were clustered to produce the following geographic regional areas: (1) Metro-Calgary and Metro-Edmonton; (2) metropolitan, regional, and rural areas; and (3) Calgary, Edmonton, Grande Prairie, Lethbridge, Medicine Hat, and Red Deer regions. Details of the various clustering strategies employed are discussed in the subsections which follow.

Metro-Calgary and Metro-Edmonton

In view of the growing trend toward highly complex and specialized medical technology and cure-oriented philosophy of medical treatment, particular importance was accorded to the examination of the elderly's hospital utilization rates in those areas where such progressive trends were most evident. Accordingly, the first clustering strategy involved the comparison of trends in the elderly's hospital utilization rates for the Metro-Calgary (District 93) versus the Metro-Edmonton (District 106) districts. Both of these metropolitan areas in the province were deemed to be similar with respect to: (1) a relatively high level of population density; (2) socioeconomic conditions; (3) incidence of disease; (4) organization of health services; (5) availability of several levels of health care, including the highest tertiary level; (6) ready accessibilty to hospital care by way of a good system of public transportation; (7) advancements in medical technology; and (8) the presence of large hospitals with greater than 300 beds. Consequently, the foregoing similarities in determinants of utilization

were expected to result in similar age-sex adjusted rates and trends in hospital utilization for the two metropolitan hospital districts.

Despite the similarities in the two metropolitan hospital districts, there was a significant difference in geographic size, with the Metro-Calgary district being notably larger. The impact of this size difference might be expected to affect hospital-specific utilization rates due to the influence of distance and travel time on utilization; however, it was not expected to significantly affect district-specific utilization rates. In a study of surgical utilization rates in Alberta, Macdonald (1983) had adjusted for this size difference by aggregating surrounding suburban districts with the Metro-Edmonton hospital district. This adjustment was not considered entirely appropriate to this study of the elderly's hospital utilization patterns since the suburban areas tended to be more urban/rural than metropolitan, with less developed transportation systems and significantly smaller hospitals; thereby, the elderly's utilization patterns in the suburban areas were also expected to differ from the metropolitan areas.

Metropolitan, Regional, and Rural Areas

Whereas the first regional analysis involved the comparison of utilization rates between regions with characteristically similar determinants of health services utilization, the second regional analysis was designed to compare the elderly's hospital utilization rates between

geographic regions with overall dissimilar societal, health delivery system, and individual determinants of utilization. The resulting clusters of hospital districts, also employed by other investigators (Macdonald, 1983; Romeril, 1984; Toll, 1982), were categorized as either: (1) metropolitan; (2) regional; or (3) rural. Among other factors, these areas were assumed to exhibit differences in socioeconomic conditions; the availability of various medical technologies; the supply of physician manpower; distance and travel time to source of care; average hospital size and the number of hospital beds available; demographic characteristics of the population; and the availability of long-term care facilities.

The tri-level classification scheme represented different levels of urbanization and was also considered to reflect the availability of the highest level of health services - primary, secondary, or tertiary (Trivedi, 1978). Tertiary level care was available in metropolitan areas only, nevertheless, secondary and primary levels of care were also present in metropolitan communities. Moreover, secondary and primary level care was present in regional areas, and rural areas had available primary level care only. Thus, the three hospital district clusters were not mutually exclusive with respect to the level of care available. Conceptually, from a referral center, provider-based perspective, metropolitan hospitals would provide all three levels of care to metropolitan residents,

tertiary and secondary level care to residents of nearby communities, and tertiary level care to residents of distant communities.

Within the context of this study, the metropolitan hospital district cluster included both the Metro-Calgary (District 93) and Metro-Edmonton (District 106) hospital districts. The regional cluster was composed of the major urban centres in Alberta, including Grande Prairie (District 14), Lethbridge (District 65), Medicine Hat (District 69), and Red Deer (District 15). The remaining hospital districts (Districts 1-13, 16-64, 66-68, 70-92, 94-105, 149, 150 , and 154) were aggregated to form the rural cluster. Figure 3 illustrates the geographic distribution of these hospital district clusters throughout the province.

Of noteworthy significance was the exclusion of District 99 (Fort McMurray) from the regional cluster. At the present time, Fort McMurray is regarded somewhat as a regional hospital referral centre for the residents of the extreme northeastern parts of the province; however, due to the longitudinal trend analysis research focus of this study and the use of historic data extending to before the time Fort McMurray acquired regional status, the exclusion of the Fort McMurray hospital district from the regional cluster was considered justifiable.

Based on the postulated differences in the determinants of utilization among the three clusters and on research findings in the literature regarding the utilization of

Figure 3

Configuration of Metropolitan, Regional and Rural Hospital Districts

health services by the elderly (Shapiro & Roos, 1984), the results of this investigation were expected to reveal higher rates of hospital utilization for rural areas, as compared to metropolitan and regional areas. Moreover, the average length of stay was expected to be the highest for the metropolitan areas.

Calgary, Edmonton, Grande Prairie, Lethbridge, Medicine Hat, and Red Deer Regions

A geographic and a regional referral centre perspective was adopted for the third clustering strategy. The underlying basis for the geographic regions which were developed was proximity, via major roadways, to the nearest regional referral centre. Furthermore, where possible, the clustering strategy attempted to control for some degree of association between the acute care hospital sector and the long-term care sector. This was considered valuable and of relevance to the prevailing issue of bed blocking and the system coordination problems inherent in the transfer of long-stay elderly patients to long-term care facilities. Accordingly, where possible, boundaries for the geographic regions were established in a manner which would attempt to reflect the elderly's tendency to seek both acute hospital care and nursing home care in the same region.

The clustering strategy employed in this analysis modified the clustering strategies used by Macdonald (1983), Paine and Wison (1975), Romeril (1984), and Toll (1982), and also attempted to incorporate Raasok's (1979) strategy of

aggregating hospital districts into Nursing Home Areas. As a result, the six regions which were established (and the corresponding hospital districts) were:

(1) Calgary Region (Districts 3, 6, 9, 11, 19, 26, 28, 33, 35, 45, 46, 51, 56, 66, 71, 80, 93, and 154);

(2) Edmonton Region (Districts 1, 2, 4, 7, 8, 10, 13, 17, 18, 23, 34, 36, 38, 42, 47, 55, 57, 61, 63, 64, 67, 73, 75, 76, 78, 81, 83-88, 91, 92, 97, 98-101, 103, 105, 106, and 149);

(3) Grande Prairie Region (Districts 14, 21, 32, 50, 59, 60, 70, 89, 90, 96, and 102);

(4) Lethbridge Region (Districts 5, 24, 25, 27, 29, 31, 40, 48, 65, 79, 82, 95, and 150);

(5) Medicine Hat Region (Districts 53, 69, and 72); and

(6) Red Deer Region (Districts 15, 16, 20, 22, 30, 37, 39, 41, 43, 44, 49, 52, 54, and 94).

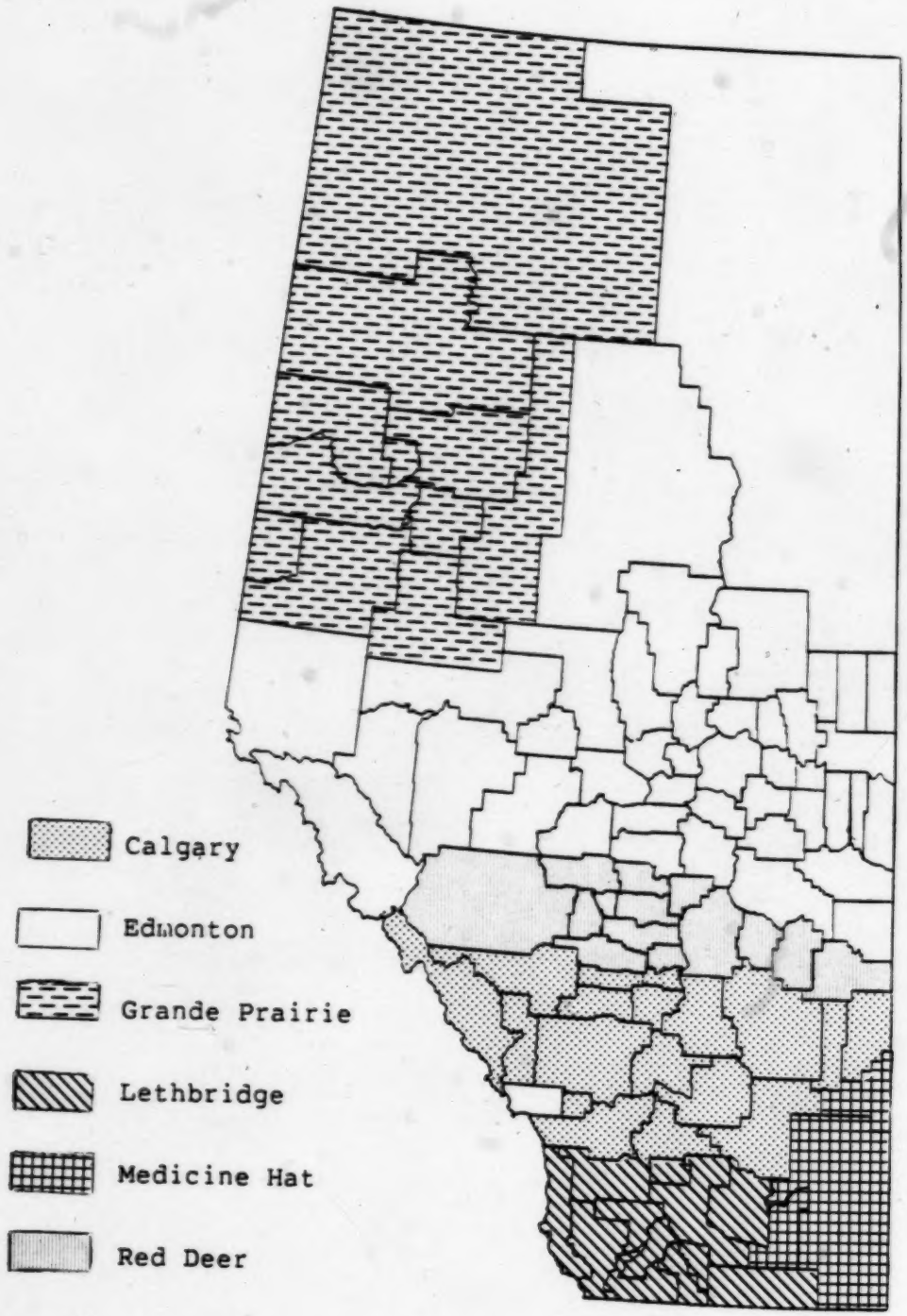
The geographic configuration of these regions is illustrated in Figure 4.

3.3.4 Patient Origin-Destination Analysis

Hospital care-seeking patterns in the province by the elderly were examined by the extension of a service population model to that of a patient origin-destination analysis. According to the patient origin-destination methodology, the elderly's hospital care-seeking patterns were investigated both from a community-based perspective and a provider-based perspective in that, the analysis

Figure 4

Configuration of Six Regional Areas



encompassed the elderly's hospital care-seeking patterns outside their community of residence, as well as to a particular group of hospitals. The results of the patient origin-destination analysis were expected to be of value for application to overall provincial health services planning endeavors and for health services planning within a particular district or region.

The patient origin-destination methodology employed in this study was consistent with that which was developed by Griffith (1972) and refined and generalized by Bay and Nestman (1980). Following this methodology, patient origin-destination flow patterns were described by means of an origin-destination matrix, consisting of an origin vector (district or cluster of districts) and a destination vector (group of hospitals). Furthermore, relevance (RI) and commitment (CI) indices formed the basis for quantifying patient utilization measures by origin and destination. Whereas the RI measure provided a relative estimate of the degree to which patients remained within or left their area of residence to receive hospital care, the CI measured the relative extent to which a particular hospital group provided services and allocated its resources to patients residing within or outside the district in which the hospital was located. Therein, whereby the RI depicted patient hospital care-seeking patterns from a community/district perspective, the CI represented these utilization patterns from a provider/hospital perspective.

Application of the RI and CI methods facilitated the identification of service populations without direct association to a specific geographic area and the quantification of differences in hospital care-seeking flow patterns between geographic areas. Nevertheless, for districts with more than one hospital, the RI methodology necessitated the assumption of homogeneity of the patients served among the hospitals within the given district. Similarly, the CI implied homogeneity of services for a given hospital, regardless of the origin of the patients served. The foregoing indices of hospital care-seeking flow patterns were computed for hospital utilization measures of SEPS, PDAYS, and ALOS. All patient origin-destination analyses involved the aggregation of data for the sixty-five year and over age group and the analyses were performed for years, 1971, 1976 and 1981/82, as well as for all years combined. Further details of the patient origin-destination analyses carried out according to the foregoing two perspectives are discussed in the sections which follow.

Community (District) Perspective

By way of the community (district) perspective, patient origin-destination analyses were designed to provide information regarding the tendency of elderly patients to remain within or leave their district/community to receive hospital care depending on: (1) the district's level of urbanization, concomitant with the availability of different levels of care in the district; and (2) the geographic and

travel time proximity to the nearest regional referral centre within the district. RIs were calculated using SEPS and PDAYS for each of the origin-destination matrices. Furthermore, these analyses were also compared with respect to the ALOS of those elderly patients remaining within and leaving their district of residence to receive hospital care; as such, the geographic and locational variability in ALOS was examined.

To indirectly assess the degree to which the level of care available within a district, as well as the district's level of urbanization, influenced the tendency of the elderly population to seek hospital care within or outside their home district, the district origin vectors which were developed involved the aggregation of all districts into one of the following categories: (1) metropolitan; (2) regional; or (3) rural. As such, the accompanying destination vector grouped all hospitals also according to these three categories. RIs were computed in terms of SEPS and PDAYS, and ALOS was analyzed for these three-by-three origin-destination matrices. The results were expected to reveal that the higher the level of care available within an area, the greater the tendency of the elderly to remain within their area of residence to receive hospital care. Nevertheless, based on the assumption that health care needs of the elderly are primarily for care, rather than cure, the RIs for regional and rural areas were expected to be relatively high.

The second analysis of elderly patients' hospital utilization patterns by origin and destination, relative to proximity to regional referral areas in the province, consisted of grouping districts of origin and hospitals of destination into the following categories: (1) Calgary; (2) Edmonton; (3) Grande Prairie; (4) Lethbridge; (5) Medicine Hat; and (6) Red Deer. Origin-destination analysis by these regions was designed to provide information regarding the relative mobility of the elderly population throughout the province in seeking hospital care. It was expected that the elderly of each region would generally remain in their home region to receive primary and secondary level care; however, the elderly residents of regions beyond Calgary and Edmonton were expected to travel to Calgary and Edmonton for tertiary level care. In this regard, due to factors of geographic proximity, the elderly residents of Grande Prairie were expected to travel primarily to Edmonton, and those of Lethbridge and Medicine Hat were expected to seek tertiary care almost exclusively in Calgary. The elderly residents of the Red Deer region were expected to travel to either Calgary or to Edmonton.

Provider (Hospital) Perspective

Results of patient origin-destination analyses from the provider (hospital) perspective were expected to yield information regarding the degree to which a group of hospitals served and/or allocated their resources to treating elderly residents from within the same district or

from other districts. In this regard, CIs were calculated to determine the proportion of elderly SEPS and PDAYS generated by a certain group of hospitals as a result of utilization by residents of the same or other geographic areas.

From the hospital perspective, hospital care-seeking patterns by the elderly were initially examined according to the highest level of care available in particular hospitals. This analysis was effected by aggregating hospitals into one of the three categories (metropolitan, regional, or rural). The results were expected to indicate that the higher the level of care available within a particular hospital category, the greater the hospital commitment to provide service to residents living outside the district.

Additionally, hospital care-seeking flow patterns relative to hospital location were analyzed according to the six regional areas in the province (Calgary, Edmonton, Grande Prairie, Lethbridge, Medicine Hat, and Red Deer). The results were expected to reveal a relatively high degree of commitment of hospitals to serving residents within their own region.

The third analysis according to the district perspective endeavored to examine patient flow patterns relative to the two metropolitan hospital groups, Calgary and Edmonton, which collectively accounted for 43.3 and 49.5 percent of the total elderly SEPS and PDAYS, respectively, for all years combined. All acute care hospitals located in Metro-Calgary were grouped to form the Metro-Calgary

hospital group, and those in Metro-Edmonton formed the Metro-Edmonton hospital group. Two types of origin-destination matrices were developed using the foregoing two hospital groups as the origin vectors. The first analysis involved the crosstabulation of the Metro-Calgary and Metro-Edmonton hospital groups with Metro-Calgary, Metro-Edmonton, regional and rural districts. Results of this analysis were expected to demonstrate that each hospital group would: (1) have the highest service commitment to the elderly residents living within its home district; and (2) have a higher commitment to the elderly residents of rural districts than of regional districts.

The second analysis employing the Metro-Calgary and Metro-Edmonton hospital groups as the origin vectors involved the crosstabulation of these groups with the following districts: (1) Metro-Calgary; (2) Surrounding Metro-Calgary (Districts 3, 6, 9, 11, 19, 26, 28, 33, 35, 45, 46, 51, 56, 66, 71, and 80); (3) Metro-Edmonton; (4) Surrounding Metro-Edmonton (Districts 1, 2, 4, 7, 8, 10, 12, 13, 17, 18, 23, 34, 36, 38, 42, 47, 55, 57, 61, 63, 64, 67, 73, 75, 76, 78, 81, 83-88, 91, 92, 97, 98-101, 103, 105, and 149); (5) Grande Prairie region; (6) Lethbridge region; (7) Medicine Hat region; and (3) Red Deer region. This analysis was intended to refine upon the information obtained from the previous analysis.

The results of the hospital perspective analyses, in conjunction with those of the district perspective analyses,

determined the demand conferred on acute care hospitals as a result of the elderly's travel and care-seeking patterns in the province.

3.4 Methodology Summary

This study of hospital utilization patterns by the elderly population in Alberta was conducted in the following three phases: (1) development of a general conceptual framework and research approach; (2) acquisition and development of appropriate data and data files; and (3) development of suitable data analytic strategies. The major aspects of the methodology employed may be summarized as follows:

1) The conceptual framework which was employed endeavored to represent, in general terms, the complex and dynamic interaction between determinants of utilization in producing actual utilization behavior. As such, the model illustrated the inter-relationship between societal, health delivery system, and individual determinants of utilization behavior and the concepts of need, demand and supply.

2) Given the scope of the research objectives of this study and the general nature of the conceptual model, the overall research approach included: (1) an exploratory, descriptive research approach of selected aspects of the utilization of acute care hospitals; (2) a trend analysis strategy employing longitudinal,

retrospective data and spanning 1971-1981/82; and (3) a comparative, population-based analysis of hospital utilization rates by the elderly, as compared to the rest of the population (nonelderly).

3) Three data sources were utilized for this study. Provincial annual reports, compiled by the Alberta Hospital Services Commission, for years 1971 to 1977, and by the Department of Hospitals and Medical Care, for years 1978/79 to 1981/82, provided descriptive statistics regarding selected aspects of the hospital system in Alberta. Census data facilitated the calculation of population-based utilization rates and provided information on population growth in the province. Acute care hospital utilization data, in the form of computerized PAS separation abstracts, for the period January 1, 1971 to March 31, 1982, constituted the main data source which was manipulated in the data analytic steps.

4) The four data analysis strategies employed in this study included: (1) an overall provincial analysis of the trends in the rates and patterns of hospital utilization by the elderly and nonelderly segments of the population from 1971 to 1981/82; (2) an analysis of overall hospital utilization rates by the elderly, by hospital districts; (3) an examination of regional, geographic variation in elderly utilization rates; and (4) an investigation of hospital care-seeking patterns

throughout the province by the elderly, by way of patient origin-destination analysis, employing a community (district) and a provider (hospital) perspective.

CHAPTER IV

RESULTS

The research findings of this study are presented and discussed according to the following four data analytic strategies which were executed: (1) provincial utilization trends for the elderly and nonelderly; (2) interdistrict variation in hospital utilization rates by the elderly; (3) regional variation in elderly utilization rates; and (4) patient origin-destination analyses of the elderly's hospital care-seeking patterns in the province. Moreover, the results are presented within the context of the Alberta hospital system and the overall population trends in the province.

4.1 Alberta Profile

Alberta census data and information from provincial annual reports were examined in order to place the research findings of this study into a proper systems perspective, in relation to the overall demographic and health care delivery system characteristics and trends in the province. Moreover, the intent was to establish a background scenario and to identify population and health delivery system characteristics which might affect Alberta's hospital utilization patterns by the general population and the elderly. The results of this analysis are presented herein.

4.1.1 Population Trends

Alberta experienced a 37.4 percent increase in total population from 1971 (1.63 million) to 1981 (2.24 million) (Table 1). The trend in total population growth was higher for the period 1976-1981 (21.7 percent) than for 1971-1976 (12.8 percent). Whereas a similar overall proportional increase was observed for those under 65 years (37.4 percent) as for the elderly (37.2 percent), the higher growth in the total provincial population between 1976-1981 was mainly due to a greater increase in the nonelderly segment of the population. The observation that the relative contribution of the increase in the elderly to the total population increase was lower between 1976-1981 (6.4 percent) than between 1971-1976 (8.9 percent), further substantiated this deduction. The higher increase in the under 65 year age group between 1976-1981 was assumed to be attributed primarily to the economic "boom" times in Alberta during the 1970s and the employment-seeking migration of those 20-39 years of age into the province.

Relative to the Canadian average, Alberta was noted to be a relatively "young" province. Whereas the elderly comprised 8.1, 8.7 and 9.2 percent of the total Canadian population in 1971, 1976 and 1981, respectively (Rosenberg, 1983; Statistics Canada, 1979), for the same years the elderly accounted for 7.3, 7.5 and 7.3 percent of the total Alberta population. However, the growth in the elderly population, relative to the total population, over the

Table 1
Alberta Population Trends for Census Years 1971, 1976 and 1981

Age Group (Years)	Population by Census Year 1971 (%) A	1976 (%) B	1981 (%) C	Percentage Change 1971-76 (B-A)/A	1976-81 (C-B)/B	1971-81 (C-A)/A
Under 65	1,509,855(92.7)	1,700,355(92.5)	2,074,030(92.7)	12.6	22.0	37.4
65-69	41,715 (2.6)	48,500 (2.6)	57,465 (2.6)	16.3	18.5	37.8
70-74	30,360 (1.9)	36,885 (2.0)	43,185 (1.9)	21.5	17.1	42.2
75 plus	47,080 (2.9)	52,485 (2.9)	62,840 (2.8)	11.5	19.7	33.5
Total 65 plus	119,155 (7.3)	137,870 (7.5)	163,490 (7.3)	15.7	18.6	37.2
Total Population	1,629,010 (100)	1,838,205 (100)	2,237,520 (100)	12.8	21.7	37.4
Elderly Females						
65-69	20,380(17.1)	24,695(17.9)	30,455(18.6)	21.2	23.3	49.4
70-74	15,030(12.6)	18,595(13.5)	23,075(14.1)	23.7	24.1	53.5
75 plus	23,755(19.9)	28,840(20.9)	35,620(21.8)	21.4	23.5	49.9
Total	59,165(49.7)	72,130(52.3)	89,150(54.5)	21.9	23.6	50.7
Elderly Males						
65-69	21,335(17.9)	23,970(17.4)	27,020(16.5)	12.4	12.7	26.7
70-74	15,330(12.9)	18,385(13.3)	19,975(12.2)	19.9	8.7	30.3
75 plus	23,325(19.6)	23,420(17.0)	27,195(16.6)	0.4	16.1	16.6
Total	59,990(50.3)	65,775(47.7)	74,190(45.5)	9.6	12.8	23.7
Total Elderly	119,155 (100)	137,870 (100)	163,490 (100)	15.7	18.6	37.2

eleven year period, was slightly higher for Alberta (37.2 percent) as compared to all of Canada (approximately 35 percent).

As noted previously, the elderly population of Alberta increased by 37.2 percent from 1971 to 1981. Although sizeable increases occurred for each age category (Table 1), the growth in the 65-69 and 75 plus age groups contributed the most (35.5 percent contribution each) to the total increase in the elderly over the ten years. Given that the age range of the foregoing age categories differ, particularly the open-endedness of the 75 plus year age group, the increase in the total elderly population was considered to be primarily attributed to the increase in the 65-69 year age group. These findings provided only partial support to the observation of other authors (Kovar, 1977; Schwartz, 1982) that the proportion of those elderly over 75 years of age is increasing more rapidly than those 65-69 years. In this regard, the Alberta figures demonstrated that whereas the 65-69 year age group increased by 37.8 percent from 1971 to 1981, the 75 plus age group increased by 33.5 percent; however, the difference between the percentage increase for the 1971-1976 period and that for the 1976-1981 period (i.e. (C-B)/B-(B-A)/A), as denoted in Table 1) was greater for the 75 year age group than for the 65-69 year group.

Analysis of elderly population trends in Alberta by age and sex category revealed that, whereas, from 1971 to 1981, the proportion of elderly females relative to the total

elderly population had increased, the proportion of elderly males had declined. Accordingly, the elderly population was comprised of 49.7 percent females and 50.3 percent males, in 1971; by 1981, this proportion became 54.5 percent females and 45.5 percent males. Furthermore, the overall increase in elderly females (50.7 percent) was significantly higher than the increase in elderly males (23.7 percent) over the eleven year period. In addition, the relative contribution of the increase in elderly females to the total increase in the elderly population by far exceeded the contribution by elderly males, in that the increase in elderly females accounted for 67.6 percent of the total increase in the elderly from 1971 to 1981. Of noteworthy observation was the trend toward a greater proportion and increase in elderly females, rather than males, aged 75 years and over. These findings supported those of MacMahon and Puch (1970) and implied the operative influence of a sex differential in life expectancy being in favor of the female population.

In brief summary, the foregoing population trends revealed that:

1) During the study period, Alberta was a relatively "young" province, whereby the nonelderly segment of the population accounted for a greater increase in total population, during 1976-1981, than the elderly segment.
2) The 37.2 percent increase in the elderly population from 1971 to 1981 was mainly attributed to the increase in the elderly females, with the relative proportion of

elderly females to the total elderly population increasing.

3) The increase in the total elderly population was primarily attributed to the increase in the 65-69 year age group.

4.1.2 Alberta Hospital System

Provincial responsibility for the financial administration of Alberta's hospital system was assumed by the Department of Hospitals and Medical Care in January 1978. From April 1971 to December 1977, the Alberta Hospital Services Commission maintained this responsibility. It is acknowledged that this system change in provincial administrative responsibility may have affected the operation and utilization of Alberta hospitals; however, the precise measurement of the degree of this influence was beyond the scope of this study. As such, the effect of this confounding variable was considered to have neglible impact on the research findings of this study.

Alberta's hospital system is comprised of hospital districts which divide the province into 103 mutually exclusive and exhaustive geographic areas (Figure 2). Throughout the province, hospital districts exhibit significant differences with respect to size, population characteristics, means of transportation, and type, size and location of general hospitals. In terms of size and population density, hospital districts located in the

northern part of the province tend to have larger land surface areas and lower population densities, as compared to hospital districts located in the central or southern part of the province. Such demographic and geographic variations and dissimilarities in hospital districts were expected to influence hospital utilization patterns twofold. Firstly, variabilities in the size of hospital districts would presumably result in variabilities in distance and/or travel time from residence to the hospital facility. Since distance and other travel factors have been identified as significant determinants of utilization in the literature reviewed, any observed hospital utilization rate variations among the hospital districts may be partly attributed to differences in factors related to travel. Secondly, disparities in hospital district population density may affect the type and number of health care resources available, thereby, resulting in differences in utilization patterns.

Generally, the distribution of general acute care hospitals within hospital districts has been relatively uniform, with one hospital per hospital district. Nevertheless, both metropolitan districts (Metro-Calgary and Metro-Edmonton), one regional district (Lethbridge), and six rural districts (Beaverlodge-Hythe, Bonnyville, Cold Lake, Flagstaff-Hughenden, Fort Vermilion, and Lamont-Mundare-Willingdon) have had more than one hospital. Two hospital districts (Blood Indian Reserve and County of Wheatland) have no hospital. The total number of acute general (public

and federal) hospitals in the province has remained constant from 1971 to 1981 at 125. Whereas in 1971 there were 121 approved general hospitals (two of which were contract general hospitals) and four federal hospitals; in 1981, the composition included 123 approved general hospitals and two federal hospitals. During 1980/81, two federal hospitals, Colonel Belcher and Charles Camsell General, were transferred to provincial jurisdiction.

As noted in the literature review, the supply of hospital beds was shown to be an important determinant of hospital utilization, for the general population and for the elderly. Trends in the supply of hospital and nursing home beds in Alberta from 1971 to 1981 are summarized in Table 2. In general, the total rated bed capacity of the 125 acute care hospitals has increased slightly over the eleven years; however, with increasing population trends, the supply of acute care beds per 1000 persons had declined steadily, from a high of 7.4, in 1971, to a low of 5.4, in 1981. Tangent to this study focusing on the hospital utilization patterns of the elderly population is the supply of long-term hospital and nursing home beds. As indicated in Table 2, the provincial supply of long-term care hospital beds per 1000 persons remained relatively constant from 1971 to 1981. In contrast, the trend has been toward decreasing supply of nursing home beds per 1000 elderly persons.

Table 2
Supply of Acute Care, Long-Term Care and Nursing Home Beds in Alberta: 1971-1981

Year	Rated Bed Capacity			Per Capita Bed Supply		
	Acute Care [1]	Long-Term	Nursing Home	Acute Care [2]	Long Term [3]	Nursing Home [4]
1971	11,970	2943	5671	7.4	1.8	47.6
1972	12,025	2933	6059	7.3	1.8	49.4
1973	12,041	3183	6792	7.2	1.9	53.8
1974	11,956	3167	6794	7.0	1.8	52.2
1975	11,978	3186	6869	6.8	1.8	51.3
1976	11,796	3256	6948	6.4	1.8	50.4
1977	11,655	3063	7025	6.2	1.6	49.2
1978	12,004	3445	7025	6.0	1.7	47.4
1979	12,038	3668	7132	5.8	1.8	45.2
1980	12,079	3903	7255	5.6	1.8	44.2
1981	12,345	4213	7286	5.4	1.8	43.1

1 The total yearly number of general hospital beds in Alberta approved either by the Provincial or Federal Government and as reported in the Annual Report.

2 Given as the number of acute care beds per 1000 persons.
(Total acute care rated bed capacity/Alberta's population as given in the Annual Report) x 1000.

3 Given as the number of long-term care beds per 1000 persons.
((Rated Auxiliary hospital beds + rated long-term care beds in general hospitals)/Alberta's population) x 1000.

4 Given as the number of nursing home beds per 1000 elderly persons.
(Total rated bed capacity of Nursing Homes/Alberta's population 65 years of age and over) x 1000.

Source: Alberta Hospital Services Commission, Annual Reports 1971 to 1977.
Alberta Hospitals and Medical Care, Annual Reports 1978/79 to 1981/82.

The foregoing scenario demonstrated that while the actual number of acute hospital care, long-term hospital care, and nursing home beds had been increasing, this increase was not proportional to the population increase. In view of the population trends for the elderly, the observed statistics on bed supply were interpreted to represent an actual decrease in long-term and nursing home bed supply.

4.2 Provincial Utilization Trends

A longitudinal, comparative and population-based provincial analysis of hospital utilization rates was performed, employing PAS and census data, to investigate total provincial trends in utilization rates from 1971 to 1981/82 and to compare and contrast these trends between the elderly and nonelderly segments of the population. The hospital utilization measures which were examined included SEPS, PDAYS, and ALOS. Thus, this analysis was intended not only to provide a general overview of utilization patterns, but also to provide some insight into the influence of age on hospital utilization and the relative consumption of acute care resources by the elderly.

4.2.1 Total Population Utilization Trends

The examination of crude hospital utilization measures for the eleven years of the study period revealed opposing overall trends in the actual number of yearly SEPS and PDAYS generated in all Alberta hospitals. From 1971 to 1981/82,

the total number of SEPS increased by 6.8 percent, with the increase being greater between 1971 and 1976 (4.4 percent) than between 1976 and 1981/82 (2.3 percent) (Tables 3 and 4). In contrast, total yearly PDAYS had decreased by 6.1 percent from 1971 to 1981/82, with the decrease being lower from 1976 to 1981/82 (2.6 percent) than from 1971 to 1976 (3.6 percent).

Trends in yearly hospital utilization rates for the total population are presented in Table 5. Although the actual number of SEPS increased slightly over the years, the SEPRATE demonstrated a gradual decreasing trend over the same time period. The total population SEPRATE decreased from a high of 228, in 1972, to a low of 177 separations per 1000 person-years in 1981/82, thereby, reflecting a 22.4 percent decrease. Given that the SEPRATE is a function of SEPS and population size (SEPRATE=SEPS/#Persons), the observed decreasing SEPRATE was explained by the fact that the increase in population size occurred at a much faster rate than did the number of separations. Thus, the increase in SEPS was not directly proportional to the increase in the population.

Like the SEPRATE, the PDAYRATE and ALOS exhibited a decreasing trend. Between 1971 and 1981/82, the PDAYRATE declined by 31.6 percent. A decreasing PDAYRATE was consistent with the decrease in PDAYS and increasing

Table 3
Elderly, Nonelderly and Total Population SEPS and PDAYS: 1971-1981/82

Year	SEPS				PDAYS			
	Nonelderly	Elderly	Total	% Elderly/Total	Nonelderly	Elderly	Total	% Elderly/Total
1971	319,669	50,337	370,006	13.6	2,348,326	820,144	3,168,470	25.9
1972	327,312	53,812	381,124	14.1	2,410,176	840,388	3,250,564	25.9
1973	319,056	54,704	373,760	14.6	2,271,662	861,426	3,133,088	27.5
1974	324,252	55,982	380,234	14.7	2,257,385	873,910	3,131,295	27.9
1975	325,071	57,339	382,410	15.0	2,189,926	909,437	3,099,363	29.3
1976	326,988	59,340	386,328	15.4	2,140,970	913,457	3,054,427	29.9
1977	331,552	60,347	391,899	15.4	2,093,589	920,580	3,014,169	30.5
1978	331,961	62,239	394,200	15.8	2,099,578	949,412	3,048,990	31.1
1979/80	336,433	63,955	400,388	16.0	2,096,229	975,549	3,071,778	31.8
1980/81	329,200	64,309	393,509	16.3	2,004,795	976,636	2,981,431	32.8
1981/82	330,140	65,011	395,151	16.5	1,984,808	990,891	2,975,699	33.3
1971-81/82	3,601,634	647,375	4,249,009	15.2	23,897,444	10,031,830	33,929,274	29.6

Table 4

Percentage Increase* in SEPS, PDAYS and ALOS for the Elderly, Nonelderly and Total Population

Utilization Measure	Population	Years 1971-76	1976-81/82	1971-81/82
SEPS	Total	4.4	2.3	6.8
	Nonelderly	2.3	1.0	3.3
	Elderly	17.9	7.7	29.2
PDAYS	Total	(3.6)	(2.6)	(6.1)
	Nonelderly	(8.8)	(7.3)	(15.5)
	Elderly	11.4	7.6	20.8
ALOS	Total	(7.0)	(3.8)	(6.1)
	Nonelderly	(10.0)	(7.8)	(17.6)
	Elderly	(5.5)	(1.3)	(6.7)

* Decrease is denoted in brackets ().

Table 5
Total Alberta Population Hospital Utilization Trends: 1971-1981/82

Year	SEPRATE [1]	PDAYRATE [2]	ALOS [3]
1971	227	1.9	8.6
1972	228	1.9	8.5
1973	219	1.8	8.4
1974	217	1.8	8.2
1975	213	1.7	8.1
1976	210	1.7	7.9
1977	205	1.6	7.7
1978	198	1.5	7.7
1979/80	194	1.5	7.7
1980/81	183	1.4	7.6
1981/82	177	1.3	7.5
1971-81/82	205	1.6	8.0

1 Number of separations per 1000 person-years.

2 Number of patient-days per person-year.

3 Average number of patient-days per separation.

population size. Over the eleven years, the ALOS dropped by 12.8 percent, from a high of 8.6 patient-days per separation to a low of 7.5 patient-days per separation, with the drop being almost twice as great between 1971-1976 (0.7 patient-days) than between 1976-1981/82 (0.4 patient-days).

In general, the observed findings for the total population indicated that, although the actual total number of hospital SEPS have increased with increasing population growth, this was generally accommodated by decreasing PDAYRATE and ALOS; thereby increasing overall hospital throughput. The observed changes in the utilization measures, particularly PDAYRATE and ALOS, could possibly be the result of the interaction between decreasing per capita supply of acute care beds (Table 2) and increasing population size (Tabel 1). The decreasing rate of change of hospital utilization measures suggested the attainment of a plateau effect.

4.2.2 Elderly and Nonelderly Utilization Trends

The comparison of hospital utilization trends between the elderly and nonelderly segments of the population produced valuable findings regarding trends in the relative consumption of acute care hospital resources by the two groups, in comparison to the total population. Whereas directional trends in the actual number of SEPS and PDAYS generated by the nonelderly segment of the population were consistent with those of the total population, the magnitude

of the changes differed. During 1971-1981/82, nonelderly SEPS increased by 3.3 percent and PDAYS decreased by 15.5 percent (Table 4). In relative terms, nonelderly SEPS increased only one-half as much as those of the total population and nonelderly PDAYS decreased 2.5 times those of the total population. In comparison, the number of elderly SEPS increased by 29.2 percent over the eleven years; however, this increase was four times that of the total population and eight times that of the nonelderly segment of the population. Furthermore, a trend toward an increasingly higher proportion of elderly SEPS and PDAYS to that of the total population was observed. The proportion of elderly to total population SEPS increased from 13.6 percent, in 1971, to 16.5 percent, in 1981/82; however, the proportion of elderly to total population PDAYS increased from 25.9 percent to 33.3 percent, from 1971 to 1981/82, respectively (Table 3).

Comparative analysis of the foregoing descriptive results obtained from crude hospital utilization measures indicated an overall trend toward increasing relative consumption of acute care hospital resources by the elderly segment of the population in Alberta. Whereas in 1971 those aged sixty-five years and over comprised 7.3 percent of the total provincial population, they consumed 25.9 percent of all the patient-days. By 1981, this group still comprised 7.3 percent of the total population, however, it used up 33.3 percent of the total patient-days. In view of the fact

that the overall percentage increase in population was similar for the elderly (37.2 percent) and the nonelderly (37.4 percent) between 1971 and 1981, the increasing trend in the consumption of hospital PDAYS by the elderly suggested the existence of a replacement effect, in that the increased use of acute care hospitals by the elderly seemingly occurred at the "expense" of the younger nonelderly population. Moreover, given the decreasing per capita supply of acute care beds, the increase in the elderly PDAYS could possibly have represented an increasing "burden" on acute care hospitals by the elderly population.

In order to make the comparison of resource consumption more meaningful, an attempt was made to control for the effects of population size in each group. This was achieved by comparing per capita consumption rates between the nonelderly and the elderly (by three age categories). The analysis and comparison of yearly per capita SEPRATEs between the elderly and nonelderly population revealed a general declining trend for both groups, however, of different degrees. For the overall eleven year period, the elderly SEPRATE was 2.3 times that of the nonelderly SEPRATE, 422 separations per 1000 elderly person-years versus 187 separations per 1000 nonelderly person-years, respectively (Table 6). Whereas the nonelderly SEPRATE demonstrated a steady gradual decline over the years, resulting in an overall 25 percent decrease, from 212 separations per 1000 nonelderly person-years, in 1971, to

Table 6
Trends in SEPRATEs* for the Elderly and Nonelderly Population: 1971-1981/82

Year	Elderly			Total Elderly	Nonelderly
	65-69 Years	70-74 Years	75 plus Years		
1971	334	397	518	422	212
1972	347	417	534	439	212
1973	334	406	540	433	202
1974	329	421	529	430	200
1975	331	405	534	428	196
1976	324	403	548	430	192
1977	318	393	541	423	187
1978	310	391	547	422	180
1979/80	308	380	548	419	176
1980/81	288	363	547	407	165
1981/82	276	364	532	398	159
1971-81/82	316	393	538	422	187

* Number of separations per 1000 respective person-years.

159 separations per 1000 nonelderly person-years 1981/82; the elderly SEPRATE decreased by only 5.7 percent during the same time period, from 422 separations per 1000 elderly person-years, in 1971, to 398 separations per 1000 elderly person-years, in 1981/82. Nevertheless, the elderly SEPRATE fluctuated to some degree with an increase occurring between 1971-72 and between 1975-76. For the nonelderly population, the percentage decrease was greater in the latter five years (17.2 percent) than in the first five years (9.4 percent). The lower decrease in SEPRATE for the elderly population was consistent with the previous observation of a higher relative increase in elderly SEPS, as compared to nonelderly SEPS.

Analysis of per capita SEPRATEs within the elderly group, by age category, revealed some degree of variability between different ages. The observed relationship was that of increasing SEPRATE with increasing age, with the overall rates for the eleven year period being 316, 393 and 538 separations per 1000 respective person-years for the 65-69, 70-74 and 75 plus year age groups, respectively (Table 6). These results were consistent with those of Mossey, Havens, Roos and Shapiro (1981). In contrast to the less pronounced trend toward overall decreasing yearly SEPRATEs for the 65-69 and 70-74 year age groups, the 75 plus year age group demonstrated an overall trend, although relatively gradual and more stable, toward increasing SEPRATEs over the years. These comparative findings suggested that, with respect to

the utilization of, and perhaps need for, acute care hospital services, the elderly are not a homogeneous group.

The comparison of trends in the relative consumption and utilization of acute care hospital resources between the elderly and nonelderly was further analyzed by way of the PDAYRATE. Whereas, for the entire eleven year period, the total elderly population utilized an average of 6.5 patient-days per elderly person-year, the nonelderly population used an average of 1.2 patient-days per nonelderly person-year; that is, this relative difference was approximately 5.4 times greater for the elderly as compared to the nonelderly (Table 7). Although an overall trend toward decreasing yearly PDAYRATEs was observed for both the elderly and nonelderly segments of the population, the decrease between 1971-1981/82 was steeper for the nonelderly than for the elderly, 37.5 percent versus 11.9 percent decrease, respectively.

Research findings indicated that, for the total period 1971-81/82, the average PDAYRATEs were 4.0, 5.5 and 9.6 patient-days per respective person-year for the 65-69, 70-74 and 75 plus year age groups, respectively (Table 7). These results confirmed the previous findings of this study, as well as others (Roos, Shapiro, & Roos,1984), of increasing hospital utilization rates with increasing elderly age groups; however, whereas the overall SEPRATE for the 75 plus year age group was 1.7 times that of the 65-69 year group, the overall PDAYRATE was 2.4 times greater for the 75 year

Table 7
Trends in PDAYRATEs* for the Elderly and Nonelderly Population: 1971-1981/82

Year	Elderly 65-69 Years	Elderly 70-74 Years	Elderly 75 plus Years	Total Elderly	Nonelderly
1971	4.4	6.0	9.6	6.7	1.6
1972	4.6	6.0	9.4	6.9	1.6
1973	4.4	6.9	9.6	6.8	1.4
1974	4.3	6.1	9.3	6.7	1.4
1975	4.2	5.9	9.8	6.8	1.4
1976	4.0	5.7	9.7	6.6	1.3
1977	3.9	5.4	9.6	6.5	1.2
1978	3.7	5.4	9.7	6.4	1.1
1979/80	3.8	5.2	9.6	6.4	1.1
1980/81	3.4	5.0	9.6	6.2	1.0
1981/82	3.2	4.8	9.5	6.1	1.0
1971-81/82	4.0	5.5	9.6	6.5	1.2

* Number of patient-days per respective person-year.

and over age group. Furthermore, although a gradual trend toward decreasing PDAYRATEs was noted for the 65-69 year age group, beginning 1972, and for the 70-74 year age group, beginning 1973; the trend in the PDAYRATE for the 75 plus year age group tended to fluctuate, with the peak PDAYRATE (9.8 patient-days per 75 plus aged person-year) occurring in 1975. The relative stability of the PDAYRATEs for the 75 year and over age group suggested that the increase in the PDAYS was relatively similar to the increase in the population of this group. The decline in the PDAYRATE from 1971 to 1981/82 was more pronounced for the 65-69 year age group than for the 70-74 year age group, 27.2 percent versus 20.0 percent decrease, respectively; with the greater decrease occurring between 1976-81/82 (20.0 and 15.8 percent, respectively) than between 1971-76 (10.0 and 5.0 percent, respectively).

Yearly trends in ALOS for the elderly and nonelderly are presented in Table 8. Comparatively, the elderly's overall ALOS was 2.3 times greater than the nonelderly's, 15.5 versus 6.6 patient-days per separation, respectively. Moreover, from 1971 to 1981/82, ALOS declined by 17.8 percent (1.3 patient-days per separation) for the nonelderly population. Of noteworthy observation was the fact that, in contrast to the pattern of greater decreases in the SEPRATEs and PDAYRATEs between 1976-81/82 than between 1971-76, the decrease in the ALOS was greater between 1971-76 than between 1976-81/82 for both the elderly and the nonelderly,

Table 8
Trends in ALOS* for the Elderly and Nonelderly Population: 1971-1981/82

Year	Elderly 65-69 Years	70-74 Years	75 plus Years	Total Elderly	Nonelderly
1971	13.4	15.1	18.5	16.3	7.3
1972	13.3	14.4	17.6	15.6	7.4
1973	13.1	14.4	17.9	15.7	7.1
1974	13.1	14.5	17.6	15.6	7.0
1975	12.7	14.4	18.4	15.9	6.7
1976	12.3	14.2	17.7	15.4	6.5
1977	12.2	13.6	17.7	15.3	6.3
1978	12.0	13.7	17.7	15.3	6.3
1979/80	12.3	13.6	17.6	15.3	6.2
1980/81	11.9	13.6	17.5	15.2	6.1
1981/82	11.7	13.2	17.9	15.2	6.0
1971-81/82	12.5	14.0	17.8	15.5	6.6

* Number of patient-days per separation.

5.5 versus 1.2 percent and 11.0 versus 7.8 percent, respectively. Within the elderly population, ALOS was observed to increase with increasing age group (Kovar, 1977), with the overall ALOS being 12.5, 14.0 and 17.8 patient-days per separation for the 65-69, 70-74 and 75 plus year age groups, respectively. From 1971 to 1981/82, ALOS declined by 12.7 percent for those aged 65-69 years and by 12.5 percent for the 70-74 year age group; however, minimal changes in ALOS were noted for those aged 75 years and over. For this eldest age group, ALOS fluctuated from year to year, with the overall trend remaining relatively stable.

4.2.3 Summary of Findings

Analysis of hospital utilization rates for the elderly, nonelderly, and total Alberta population revealed the following:

1) A general trend toward increasing SEPS, decreasing PDAYS and decreasing hospital utilization rates (SEPRATE, PDAYRATE and ALOS) for the total population, between 1971 and 1981/82. These trends, having occurred concomitantly with increasing total population growth, indicated an increase in overall hospital throughout during the study period.
2) Both the elderly and nonelderly population exhibited a trend toward an increasing number of SEPS; however, in contrast to the decreasing trend in nonelderly PDAYS, elderly PDAYS increased substantially (20.8 percent)

between 1971 and 1981/82. These findings, in conjunction with the trend toward increasing proportion of elderly SEPS and PDAYS to those of the total population, implied an increasing "burden" on acute care hospitals by the elderly and the possible existence of a replacement effect, with increased elderly hospital utilization having occurred at the "expense" of the nonelderly population.

3) The elderly demonstrated significantly higher SEPRATEs, PDAYRATEs and ALOS than the nonelderly. Moreover, decreasing trends in all three utilization measures were noted for both groups; however, the decrease for the nonelderly was consistently greater than for the elderly. Thus, the decrease in total hospital utilization rates over the years was attributed primarily to significant decreases in utilization by the nonelderly population.

4) All hospital utilization rates increased with increasing elderly age group. In contrast to the trend toward decreasing SEPRATEs, PDAYRATEs and ALOS for the 65-69 and 70-74 year age groups, for the 75 year and over age group all these measures had remained relatively stable over time. Thus, the findings indicated that the elderly were not a homogeneous group with respect to the utilization of, and perhaps need for, acute care hospital services.

In general, the findings suggested that the relative consumption of acute care hospital resources by the elderly population had increased substantially over time. Overall decreases in total hospital utilization rates were primarily attributed to marked decreases in hospital utilization by the nonelderly segment of the population. Thus, given the limited amount of acute care hospital resources, the findings suggested that the elderly were replacing the nonelderly in hospitals. In view of these findings, government restraint policies for acute care hospital expenditures would most likely be achieved at the expense of the nonelderly population.

Having analyzed provincial hospital utilization patterns by the elderly, nonelderly and total population, and having assessed, to some degree, the impact of old age on hospital utilization and the relative consumption of acute care resources by the elderly, the focus of this study, from here on, was on the elderly population.

4.3 District Variation In Utilization Rates

From a provincial hospital system planning perspective, utilization rates (age-sex adjusted) were analyzed according to their geographic distribution throughout the province. Hospital utilization measures, including SEPRATEs, PDAYRATEs and ALOS, were calculated for the elderly for each hospital district for all years combined (1971-81/82). The geographic variation in district rates was examined by devising a

relative scale, based on percentage variation from the provincial rate, as follows: (1) low rate - more than 20 percent below the provincial rate; (2) moderate rate - within 20 percent below or above the provincial rate; (3) high rate - 20 percent to 60 percent above the provincial rate; and (4) very high rate - greater than 60 percent above the provincial rate. Furthermore, the distribution of the levels of utilization was assessed in terms of the representative elderly service population.

The findings revealed a high degree of variability in district SEPRATEs, throughout the province, for all years combined. Whereas the provincial elderly SEPRATE was 422 separations per 1000 elderly person-years, the district rates ranged from 278 to 1125 separations per 1000 elderly person-years. According to the relative scale, the vast majority (seventy-five) of the districts exhibited high or very high SEPRATEs, however, together these districts represented only 27.6 of the total elderly service population (Table 9).

Districts with very high elderly SEPRATEs tended to be geographically located in the northeastern and northwestern parts of the province, where districts are larger in area and population density is lower. The high and very high elderly SEPRATEs in northern districts might have been attributed to a lack of availability of alternative health care sources in these areas. Low SEPRATEs were expressed in only three districts, but these represented 47.7 percent of

Table 9
Distribution of Districts and Service Population by Levels of Elderly Hospital Utilization For All Years Combined

Utilization Measure	Level	Range	Number of Districts	% of Service Population
SEPRATE [1]	Low	337 or less	3	47.7
	Moderate	338 - 506	23	24.7
	High	507 - 675	45	18.9
	Very High	676 or more	30	8.7
PDAYRATE [2]	Low	5.1 or less	2	3.3
	Moderate	5.2 - 7.8	38	76.9
	High	7.9 - 10.4	41	14.4
	Very High	10.5 or more	20	5.4
ALOS [3]	Low	12.3 or less	25	8.8
	Moderate	12.4 - 18.6	69	89.5
	High	18.7 - 24.8	3	1.2
	Very High	24.9 or more	4	0.5

1 Range is given in terms of number of separations per 1000 elderly person-years.

2 Range is given in terms of number of patient-days per elderly person-year.

3 Range is given in terms of number of patient-days per separation.

the total elderly service population, mainly the Calgary and Edmonton districts. The lower SEPRATEs for Calgary and Edmonton suggested either a lower level of access to acute care hospitals, the availability of alternative sources of medical care, or lower rates of repeated hospitalization for the elderly in these areas, as compared to the elderly of other areas. Given that the transportation and communication systems are more developed in these metropolitan areas than in rural areas of the province, the lower level of access, if it existed, would not be expected to be due to distance or transportation factors. As such, the lower elderly SEPRATEs for Edmonton and Calgary could be interpreted to reflect different roles of hospitals in these districts, as opposed to the roles of or levels of care available in hospitals of other districts. In this regard, the hospitals located in Calgary or Edmonton would be expected to exhibit a lower commitment to the elderly residing within their district, thereby reflecting a hospital referral centre role and the availability of tertiary level care.

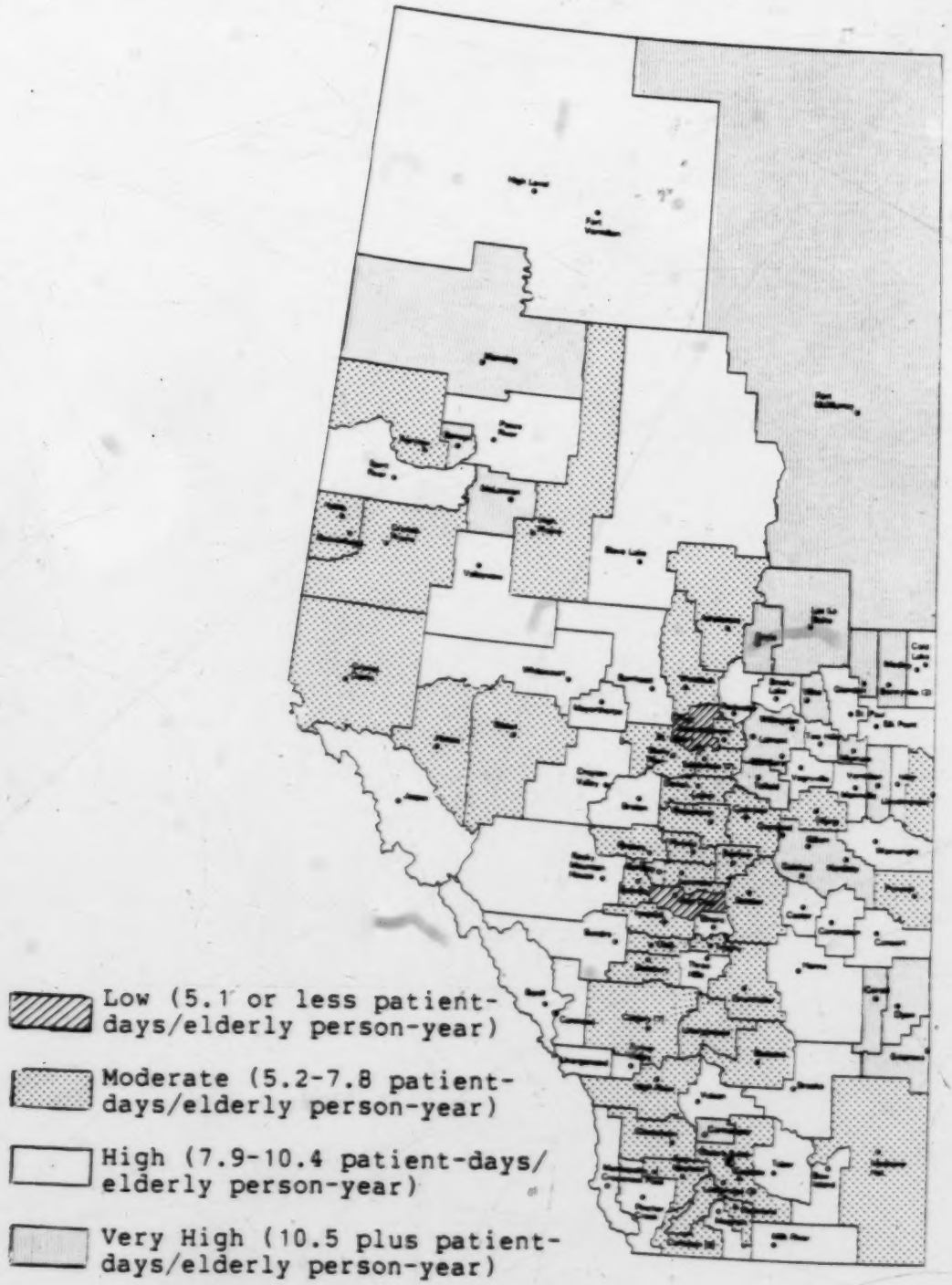
In terms of district PDAYRATEs, the rates ranged from 5.0 to 24.4 patient-days per elderly person-year, with the provincial rate being 6.5 patient-days per elderly person-year. Districts with moderate PDAYRATEs accounted for 76.9 percent of the total provincial elderly service population (61.6 percent of this service population percentage was attrributed to Calgary and Edmonton). Of noteworthy observation was the fact that the top three

highest elderly PDAYRATEs were recorded for adjacent districts Empress, Cereal, and Oyen, 24.4, 20.3, and 19.2 patient-days per elderly person-year, respectively. The reason for this was unknown. Of all the hospital districts, only Red Deer and Sturgeon demonstrated low levels of elderly PDAYRATEs. Figure 5 illustrates the geographic distribution of district levels of elderly PDAYRATEs for all years combined. Districts with very high elderly PDAYRATEs were rural districts and tended to be geographically located in the east-central and northeastern parts of the province, as well as in the northwestern part. Furthermore, the only districts with very high elderly PDAYRATEs located in the southern region of the province were Cereal, Empress, Little Bow, Oyen, and Picture Butte. Hospital districts with moderate levels of elderly PDAYRATEs generally tended to border along the north-to-south Highway 2 corridor; although several districts in the northwestern part of the province, as well as Medicine Hat to the southwest, also exhibited moderate levels of elderly PDAYRATEs. Districts with high levels of elderly PDAYRATEs were scattered throughout the province.

Among the districts, elderly ALOS ranged from a low of 9.7 (Grande Cache) to a high of 33.4 (Elnora) patient-days per elderly separation, with the provincial rate being 15.5 patient-days per elderly separation. The very high ALOS for Elnora was due to a high PDAYRATE and a low SEPRATE, thereby indicating a relatively few number of long-term cases,

Figure 5

Geographic Distribution of District Levels of Elderly PDAYRATEs for All Years Combined


Low (5.1 or less patient-days/elderly person-year)
Moderate (5.2-7.8 patient-days/elderly person-year)
High (7.9-10.4 patient-days/elderly person-year)
Very High (10.5 plus patient-days/elderly person-year)

considering the small size of the district. Besides Elnora, very high elderly ALOS was observed for Empress, Cereal and Oyen, 32.0, 30.2, and 30.0 patient-days per elderly separation, respectively. Relatively high levels of ALOS were also noted for Hanna, Crowsnest Pass, and Bentley. As such, high and very high ALOS occurred in a few districts which together accounted for 1.7 percent of the total provincial elderly service population. Thus, for these areas, the results suggested the possible use of short-term acute care beds for long-term care service delivery. Both metropolitan areas and all regional centers exhibited moderate levels of elderly ALOS in acute care hospitals. Of note was the fact that the elderly ALOS for Calgary (18.6 patient-days per separation) and Edmonton (17.7 patient-days per separation) was above the provincial average and also tended toward the upper range of the moderate scale. The tertiary care availability and the treatment of more complex illness level cases in these districts may have accounted for this observation.

In overview, the research findings regarding district variation in hospital utilization rates by the elderly indicated that:

1) The provincial elderly SEPRATE, PDAYRATE and ALOS for all years combined was 422 separations per 1000 elderly person-years, 6.5 patient-days per elderly person-year, and 15.5 patient-days per elderly separation, respectively; however, wide variations in hospital

utilization rates occurred among the districts. As such, districts with small service populations tended to exhibit rates which were at the extreme end of the scale.

2) Whereas high and very high elderly SEPRATEs and PDAYRATEs were exhibited by a large number of districts, and high and very high levels of ALOS were noted for only seven districts, these districts accounted for a relatively small proportion of the total provincial elderly service population. Thus, the findings revealed that the problem of high and very high utilization of acute care hospitals by the elderly in the province, from 1971 to 1981/82, spanned a broad geographic area; however, it encompassed less than 28 percent of the total elderly service population. As such, a small proportion of the elderly accounted for high levels of resource utilization.

3) Whereas districts with very high elderly PDAYRATEs tended to be located in the northwestern, northeastern, and east-central parts of the province, those with moderate levels primarily bordered on the north-to-south Highway 2 corridor.

4) Four districts (Bentley, Cereal, Empress and Oyen) were identified to have consistently exhibited high and very high ALOS, SEPRATEs and PDAYRATEs for the elderly segment of the population. The implication, thus, was that acute care beds in these districts may have

potentially been used in a long-term care capacity.

The foregoing findings suggested that any planning endeavors aimed at reducing the problem of high rates of hospital utilization (except for ALOS) by the elderly would need to span a broad geographic area. Nevertheless, given the small elderly service population at which any province-wide planning resolution would aim at, the cost-effectiveness of any approach would need to be examined.

Given that the foregoing district analysis was generally based on small hospital districts, in terms of population size, the estimation of utilization rates was subject to some degree of unstable estimation; thereby, rendering an overall assessment of the provincial scope of hospital utilization by the elderly difficult (as shown by Figure 5). To offset this limitation, an analysis of elderly hospital utilization rates by broad geographic areas was effected, the results of which are presented in the next section.

4.4 Regional Variation in Utilization Rates

In recognition of the high variability of Alberta's hospital districts with respect to population size and geographic and hospital utilization characteristics, several regional areas were established by clustering hospital districts according to similar or dissimilar features (outlined in section 3.3.3), and trends in hospital

utilization rates by the elderly were examined accordingly. The technique of clustering hospital districts effected data managability and generated useful information regarding regional variation in age-sex adjusted utilization rates by the elderly in the province. The findings of this analysis are presented herein.

4.4.1 Metro-Calgary and Metro-Edmonton

For each year of the study period, the Metro-Edmonton hospital district consistently exhibited higher elderly SEPRATEs than the Metro-Calgary district, with the rate for all years combined being 315 and 279 separations per 1000 elderly person-years, respectively (Table 10). Accordingly, analysis of yearly SEPRATEs as to the percentage above or below the provincial yearly rate indicated that both Metro-Calgary's and Metro-Edmonton's SEPRATEs had been consistently below the provincial elderly SEPRATEs; however, the elderly SEPRATEs for Metro-Calgary had always been further below the provincial rates than those for Metro-Edmonton. The consistently lower SEPRATEs for Metro-Calgary, as compared to Metro-Edmonton, could have been accounted for by lower access to and availability of acute care beds and/or more selective admissions.

Table 10
Trends in Elderly SEPRATEs* For Regional Areas in Alberta: 1971-1981/82

Area	1971	1972	1973	1974	1975	1976	1977	1978	1979 /80	1980 /81	1981 /82	1971-81/82
Alberta	418	436	431	429	428	431	424	422	420	408	398	422
Metro-Calgary	285	291	288	280	280	281	274	279	277	269	270	279
Metro-Edmonton	319	327	330	329	319	324	322	320	309	296	286	315
Metropolitan	302	309	309	305	300	303	298	300	293	283	278	297
Regional	367	385	370	383	395	381	389	390	384	375	376	381
Rural	555	589	584	583	585	594	581	575	579	564	546	575
Calgary	333	340	337	330	324	328	328	336	331	326	320	330
Edmonton	439	463	462	456	455	460	446	440	437	414	402	442
Grande Prairie	580	626	620	633	653	670	656	636	626	610	656	633
Lethbridge	454	470	462	481	470	468	463	460	452	471	457	464
Medicine Hat	397	412	392	401	399	400	410	426	454	439	415	415
Red Deer	480	494	474	483	499	487	483	480	487	476	456	481

* Separation rates are given as the number of elderly separations per 1000 elderly age-sex adjusted person-years.

Examination of the trends in SEPRATEs over time for these two metropolitan districts demonstrated a gradual, although somewhat unsteady, decline in elderly SEPRATEs for both districts, nevertheless, the yearly rate of decline tended to be more pronounced for Metro-Edmonton. For the overall eleven year period, the elderly SEPRATE decreased by 5.3 percent for Metro-Calgary and by 11.7 percent for Metro-Edmonton. The trend toward decreasing elderly SEPRATEs was suspected to be partly the result of a change in some health delivery system variable over the years or to changes in admissions practice/policy. The use of the 1971 provincial SEPRATE as a base for the comparison of all other SEPRATEs by district and year, indicated that the Metro-Calgary and Metro-Edmonton rates had consistently remained below the 1971 rate; and whereas all other yearly provincial rates had increased relative to the 1971 rate, those for the two metropolitan districts had decreased (Table 11).

In terms of elderly PDAYRATEs, the difference between Metro-Calgary and Metro-Edmonton was less pronounced, with the overall rate being 5.2 and 5.6 patient-days per elderly person-year, respectively (Table 12). The PDAYRATEs for Metro-Calgary and Metro-Edmonton had both been consistently below the provincial rate; however, whenever a yearly difference in the rates existed between the two districts, the higher rate always corresponded to Metro-Edmonton. The higher PDAYRATEs for Metro-Edmonton were seemingly not

Table 11
Comparative Profile of Trends in Elderly SEPRATEs For Regional Areas in Alberta: 1971-1981/82

Area	1971	1972	1973	1974	1975	1976	1977	1978	1979/80	1980/81	1981/82
Alberta	100.0*	104.3	103.1	102.6	102.4	103.1	101.4	101.0	100.5	97.6	95.2
Metro-Calgary	68.2	69.6	68.9	67.0	67.0	67.2	65.6	66.7	66.3	64.4	64.6
Metro-Edmonton	76.3	78.2	78.9	78.7	76.3	77.5	77.0	76.6	73.9	70.8	68.7
Metropolitan	72.2	73.9	73.9	73.0	71.8	72.5	71.3	71.8	70.1	67.7	66.5
Regional	87.8	92.1	88.5	91.6	94.5	91.1	93.1	93.3	91.9	89.7	90.0
Rural	132.8	140.9	139.7	139.5	140.0	142.1	139.0	137.6	138.5	134.9	130.6
Calgary	79.7	81.3	80.6	78.9	77.5	78.5	78.5	80.4	79.2	78.0	76.6
Edmonton	105.0	110.8	110.5	109.1	108.9	110.0	106.7	105.3	104.5	99.0	96.2
Grande Prairie	138.8	149.8	148.3	151.4	156.2	160.3	156.9	152.2	149.8	145.9	156.9
Lethbridge	108.6	112.4	110.5	115.1	112.4	112.0	110.8	110.0	108.1	112.7	109.3
Medicine Hat	95.0	98.6	93.8	95.9	95.5	95.7	98.1	101.9	108.6	105.0	99.3
Red Deer	114.8	118.2	113.4	115.6	119.4	116.5	115.6	114.8	116.5	113.9	109.1

* The 1971 base provincial separation rate to which the rates of all regions and years are compared to, in terms of percentage, is 418 separations per 1000 elderly age-sex adjusted person-years.

Table 12
Trends in Elderly PDAYRATEs* For Regional Areas in Alberta: 1971-1981/82

Area	1971	1972	1973	1974	1975	1976	1977	1978	1979 /80	1980 /81	1981 /82	1971-81/82
Alberta	6.8	6.8	6.8	6.7	6.8	6.6	6.5	6.4	6.4	6.2	6.1	6.5
Metro-Calgary	5.8	5.3	5.3	5.3	5.6	5.2	5.1	5.0	4.9	5.0	4.8	5.2
Metro-Edmonton	5.8	6.0	5.9	5.3	5.6	5.6	5.7	5.7	5.8	5.3	4.8	5.6
Metropolitan	5.8	5.7	5.6	5.3	5.6	5.4	5.4	5.4	5.3	5.2	4.8	5.4
Regional	5.9	5.8	5.5	6.1	6.3	5.5	5.1	5.0	5.1	4.9	4.9	5.4
Rural	8.0	8.3	8.4	8.4	8.3	8.3	8.0	8.1	8.0	7.7	7.9	8.1
Calgary	6.4	5.9	6.1	5.8	6.1	5.8	5.6	5.6	5.4	5.5	5.6	5.8
Edmonton	6.7	7.3	7.2	6.7	6.9	7.0	6.9	6.9	6.9	6.4	6.1	6.8
Grande Prairie	7.6	7.8	7.8	9.5	8.5	8.6	7.6	7.6	7.1	7.3	8.0	7.9
Lethbridge	8.2	7.7	7.2	7.4	7.5	6.8	6.5	7.0	6.7	6.8	6.2	7.0
Medicine Hat	6.9	5.8	5.5	6.5	6.6	5.8	5.1	5.2	5.9	5.2	5.4	5.8
Red Deer	6.4	6.5	6.5	7.1	6.8	7.0	6.9	6.1	6.6	6.0	6.5	6.6

* Patient-day rates are given as the number of elderly patient-days per elderly age-sex adjusted person-year.

attributed to ALOS, as Metro-Edmonton demonstrated higher SEPRATEs and lower ALOS than Metro-Calgary. Thus, plausible explanations for the differences included differences in the resource availability of beds (acute care, long-term care) and community support factors, such as home care, or perhaps differing physician practice patterns.

The comparative profile of the PDAYRATEs reflected a trend toward declining PDAYRATEs for both districts and a reduction in the differences in the PDAYRATEs between the two areas (Table 13). The reason for the decline was not evident.

The comparison of elderly ALOS in acute care hospitals between the two metropolitan centres revealed generally higher ALOS for Metro-Calgary as compared to Metro-Edmonton, 18.6 versus 17.7 patient-days per elderly separation, respectively, overall; 1972 and 1979/80 were the years in exception (Table 14). Of noteworthy significance was the observation that, in sharp contrast to the SEPRATEs and PDAYRATEs being consistently below the yearly provincial rate for both districts, the ALOS figures for both metropolitan areas were consistently and considerably above the provincial rate. For all years combined, the ALOS for elderly patients in Metro-Calgary was 3.1 patient-days higher than the provincial rate and 0.9 patient-days higher than that for Metro-Edmonton. Analysis of trends in ALOS over the years detected some fluctuation over the years,

Table 13
Comparative Profile of Trends in PDAYRATEs For Regional Areas in Alberta: 1971-1981/82

Area	1971	1972	1973	1974	1975	1976	1977	1978	1979/80	1980/81	1981/82
Alberta	100.0*	100.0	100.0	98.5	100.0	97.1	95.6	94.1	94.1	91.2	89.7
Metro-Calgary	85.3	77.9	77.9	77.9	82.4	76.5	75.0	73.5	72.1	73.5	70.7
Metro-Edmonton	85.3	88.2	86.8	77.9	82.4	82.4	83.8	83.8	85.3	77.9	70.7
Metropolitan	85.3	83.8	82.4	77.9	82.4	79.4	79.4	79.4	77.9	76.5	70.7
Regional	86.8	85.3	80.9	89.7	92.6	80.9	75.0	73.5	75.0	72.1	72.1
Rural	117.6	122.1	123.5	123.5	122.1	122.1	117.6	119.1	117.6	113.2	116.2
Calgary	94.1	86.8	89.7	85.3	89.7	85.3	82.4	82.4	79.4	80.9	82.4
Edmonton	98.5	107.4	105.9	98.5	101.5	102.9	101.5	101.5	101.5	94.1	89.7
Grande Prairie	111.8	114.7	114.7	139.7	125.0	126.5	111.8	111.8	104.4	107.4	117.6
Lethbridge	120.6	113.2	105.9	108.9	110.3	100.0	95.6	102.9	98.5	100.0	91.2
Medicine Hat	101.5	85.3	80.9	95.6	97.1	85.3	75.0	76.5	86.8	76.5	79.4
Red Deer	94.1	95.6	95.6	104.4	100.0	102.9	101.5	89.7	97.1	88.2	95.6

* The 1971 base provincial patient-day rate to which the rates of all other regions and years are compared to, in terms of percentage, is 6.8 patient-days per elderly age-sex adjusted person-year.

Table 14
Trends in Elderly ALOS* For Regional Areas in Alberta: 1971-1981/82

Area	1971	1972	1973	1974	1975	1976	1977	1978	1979 /80	1980 /81	1981 /82	1971-81/82
Alberta	16.2	15.6	15.7	15.6	15.8	15.4	15.3	15.3	15.2	15.1	15.2	15.5
Metro-Calgary	20.4	18.2	18.6	18.7	20.2	18.6	18.6	18.0	17.6	18.5	17.8	18.6
Metro-Edmonton	18.2	18.5	17.9	16.2	17.5	17.4	17.9	17.8	18.6	18.0	16.8	17.7
Metropolitan	19.2	18.3	18.2	17.4	18.7	17.9	18.2	17.9	18.1	18.2	17.3	18.1
Regional	16.2	15.0	14.8	15.9	15.9	14.5	13.2	12.9	13.4	12.9	13.1	14.2
Rural	14.4	14.2	14.4	14.4	14.1	14.0	13.9	14.1	13.8	13.7	14.4	14.1
Calgary	19.2	17.3	18.1	17.7	18.8	17.5	17.2	16.7	16.3	17.0	17.4	17.5
Edmonton	15.3	15.7	15.6	14.8	15.2	15.1	15.5	15.7	15.7	15.5	15.3	15.4
Grande Prairie	13.2	12.5	12.5	15.0	13.0	12.8	11.5	12.0	11.4	12.1	12.2	12.5
Lethbridge	18.0	16.4	15.6	15.4	16.0	14.6	14.0	15.1	14.9	14.4	13.6	15.2
Medicine Hat	17.4	14.2	14.1	16.3	16.5	14.5	12.4	12.3	13.0	11.9	13.0	14.0
Red Deer	13.4	13.2	13.6	14.8	13.6	14.3	14.3	12.7	13.5	12.7	14.2	13.7

* Average length of stay figures are given as the number of patient-days per elderly separation.

with an overall decrease in ALOS of 12.7 percent for Metro-Calgary and 7.7 percent for Metro-Edmonton occurring between 1971 and 1981/82. The higher elderly ALOS for both the metropolitan districts, as compared to the provincial rate, may have been attributed to the effects of case-mix selection favoring the treatment of a higher illness level requiring longer ALOS in these areas. Nonetheless, the higher ALOS for Metro-Calgary, as compared to Metro-Edmonton, was not immediately obvious. A plausible explanation may have been the occurrence of more selective admissions toward higher illness levels requiring longer ALOS in Metro-Calgary. Selective admissions would have been consistent with a lower bed supply in Metro-Calgary.

In brief summary, the research findings regarding hospital utilization rates for Metro-Calgary as compared to Metro-Edmonton indicated that:

1) Elderly SEPRATEs and PDAYRATEs were higher for Metro-Edmonton than for Metro-Calgary, nevertheless, both rates were below the provincial level. These results suggested either more selective admissions or a lower level of access to hospitals in the two districts, as compared to the total province; with access being lower and selective admissions being higher in Metro-Calgary than Metro-Edmonton.
2) The ALOS for the elderly in acute care hospitals demonstrated to be considerably higher for Metro-Calgary than for Metro-Edmonton; thereby, implying more

selective admissions for Metro-Calgary. However, ALOS in both metropolitan areas was consistently above the corresponding provincial average, indicating the availability of tertiary level care.

3) All hospital utilization rates for these districts exhibited a trend toward decreasing rates over the years, with the decrease in rate being greater between 1976-81/82 for SEPRATEs and PDAYRATEs for both districts, than between 1971-76. In contrast, the relative decrease in ALOS was greater between 1971-76 than between 1976-81/82, indicating a leveling-off effect. Whereas Metro-Edmonton experienced a greater overall decline in SEPRATEs and PDAYRATEs, the overall decline in ALOS was greater for Metro-Calgary.

The foregoing research findings identifying differences in hospital utilization rates between the two metropolitan areas somewhat contravened study expectations. Based on the assumption of similarities in determinants of utilization between the two areas, hospital utilization rates were expected to be similar for both Metro-Calgary and Metro-Edmonton. This expectation was realized only to the degree that both districts exhibited similar trends in utilization rates over the years and that, for both, the direction, not necessarily the magnitude, above or below the provincial rate was similar. Contrary to general expectations, SEPRATEs and PDAYRATEs tended to be higher for Metro-Edmonton, but ALOS was higher for Metro-Calgary. These

results may be interpreted to indicate general similarities in societal and individual determinants of hospital utilization by the elderly in both districts, however, some differences between the areas in terms of determinants of the health delivery system, particularly the influence of bed supply. The higher overall ALOS for the Metro-Calgary district may be indicative of selective admissions (as indicated by low SEPRATEs) or a higher illness level of those elderly utilizing acute care hospitals in Metro-Calgary, as compared to Metro-Edmonton. The exact reasons for the observed differences in utilization between the two metropolitan districts remain equivocal.

4.4.2 Metropolitan, Regional and Rural Areas

The study of hospital utilization patterns by the elderly according to metropolitan, regional and rural geographic areas revealed that the lower the level of urbanization and industrialization of an area, the higher the elderly SEPRATE. Accordingly, rural areas exhibited higher overall SEPRATEs than regional areas, which were inturn higher than metropolitan areas, 575, 381, and 297 separations per 1000 elderly person-years, respectively (Table 10). For all years combined, the provincial SEPRATE was 422 separations per 1000 elderly person-years. Whereas yearly SEPRATEs in metropolitan and regional areas were consistently below the yearly provincial SEPRATE, SEPRATEs in rural areas were always above the provincial rate. The

pattern of yearly trends in elderly SEPRATEs differed by area. For metropolitan areas, SEPRATEs declined by 7.9 percent between 1971 and 1981/82. In contrast, regional areas exhibited an overall increase (2.5 percent) in SEPRATEs, although with some fluctuation, during the same time period. By comparison, the characteristic trend in SEPRATEs for rural areas was that of an increase (7.2 percent) between 1971 and 1976, and a subsequent decrease (8.1 percent) between 1976 and 1981/82. The comparative profile of trends in SEPRATEs confirmed the preceding yearly trends, as well as indicated that rural areas exhibited SEPRATEs which were 37.6 percent higher, on average, as compared to the 1971 base rate (Table 11).

The foregoing findings delineating notable differences in elderly SEPRATEs between metropolitan, regional and rural areas implied either: (1) a higher level of access to acute care hospitals for the elderly in rural areas; or (2) a significantly higher number of repeat admissions for rural elderly; or (3) the lack of alternative sources of acute health care in rural areas. The third explanation was considered to largely account for the variance in the observed results.

In terms of elderly PDAYRATEs, metropolitan and regional areas exhibited relatively similar overall rates, both averaging 5.4 patient-days per elderly person-year, overall; however, PDAYRATEs for rural areas were significantly higher, 8.1 patient-days per elderly

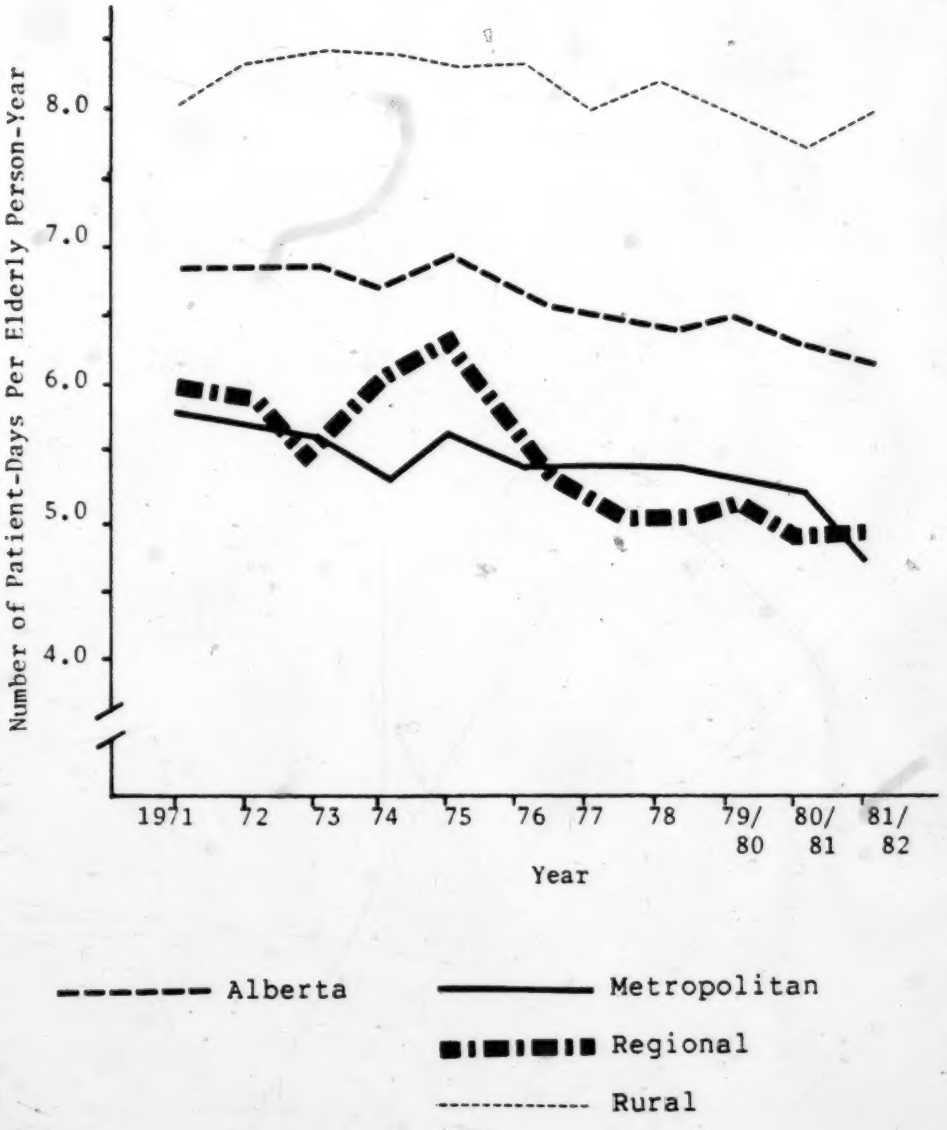
person-year, on average (Table 12). Whereas PDAYRATEs for rural districts were consistently above the provincial PDAYRATE, those rates for metropolitan and regional areas were, on average, below the provincial rate. The marked differences in the elderly PDAYRATEs between rural and regional/metropolitan areas may have been attributed to the availability of different levels of care in the areas. Moreover, a large number of elderly admissions and patient-days for social reasons would also be expected to produce the large difference in the rates.

Analysis of trends in PDAYRATEs revealed an overall trend toward declining rates for metropolitan and regional areas, with a notable increase occurring between 1973 and 1975 for regional areas, and relative stability of rates for rural areas (Figure 6). Between 1971 and 1981/82, the elderly PDAYRATE decreased by 17.2 and 16.9 percent for metropolitan and regional areas, respectively. For rural districts, the trend was toward increasing PDAYRATEs between 1971 and 1976 (3.8 percent) and decreasing rates between 1976 and 1981/82 (4.8 percent), with the overall effect being one of a marginal decline by 1.3 percent (Figure 6, Table 13).

Comparative analysis of ALOS indicated highest elderly ALOS for metropolitan areas (18.1 patient-days per elderly separation), with regional and rural areas demonstrating relatively similar ALOS for all the years combined, 14.2 and 14.1 patient-days per elderly separation, respectively

Figure 6

Trends in Elderly PDAYRATEs for Metropolitan, Regional and Rural Areas



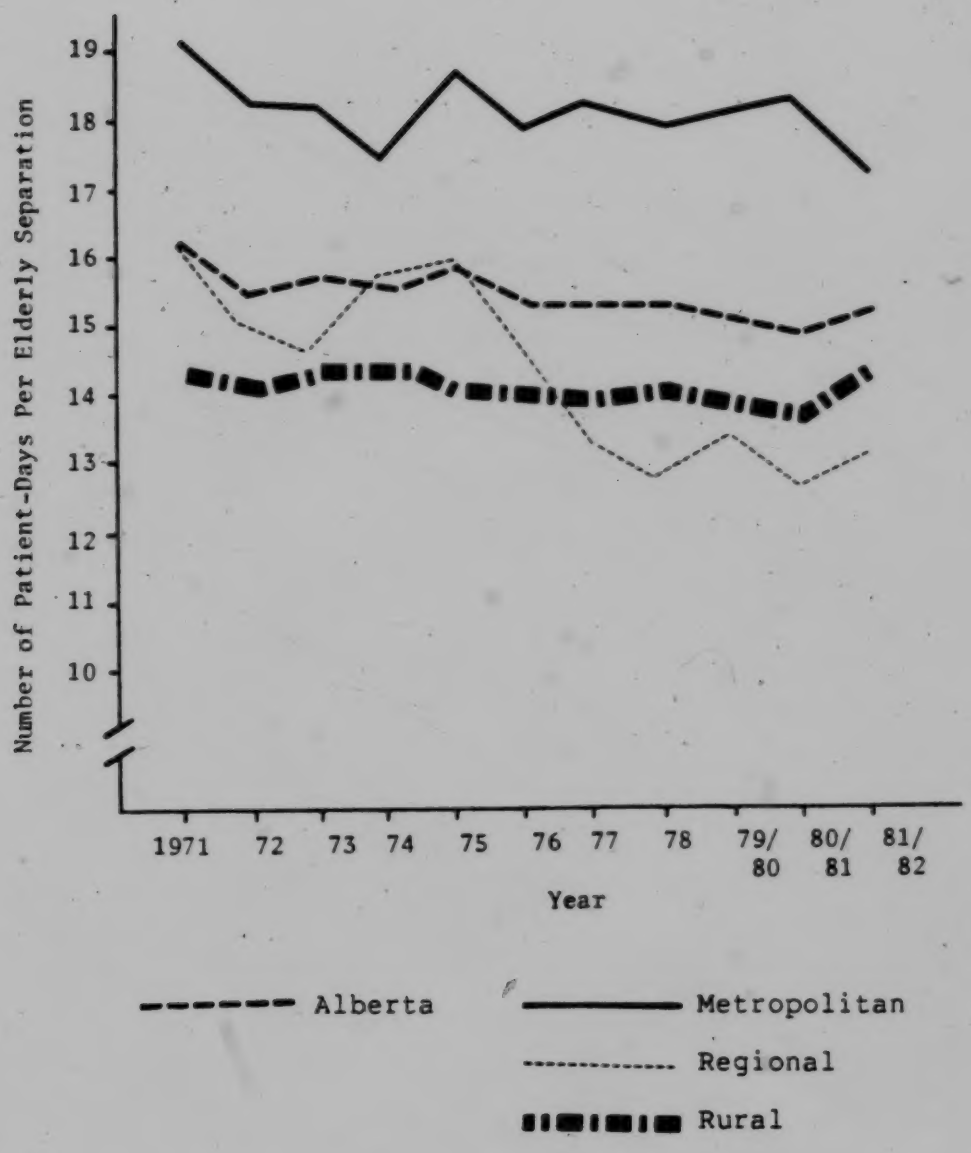
(Table 14). In general, ALOS had been below the provincial rate for regional and rural areas; however, ALOS for metropolitan areas had remained above the provincial rate. Whereas the yearly trends in ALOS have remained relatively stable for rural areas, the overall trend has been toward declining ALOS in metropolitan and regional areas, 9.9 and 19.1 percent decrease, respectively, between 1971 and 1981/82 (Figure 7). Of noteworthy significance was the fact that, between 1971 and 1976, ALOS for rural districts, was below that for regional areas; whereas, between 1977 and 1981/82, the ALOS for rural areas exceeded that of regional areas. The reason for this crossover was not evident, however, either a system change or a change in physician practice patterns may have accounted for this observation.

In overview, results regarding elderly hospital utilization rates in metropolitan, regional and rural areas revealed that:

1) With increasing levels of urbanization and levels of care available within an area, elderly SEPRATEs and PDAYRATEs tended to decrease and ALOS tended to increase. The high ALOS and low SEPRATEs and PDAYRATEs for metropolitan areas suggested the operation of a process of selective elderly admissions. Moreover, the high SEPRATEs and PDAYRATEs, in conjunction with low rural elderly. ALOS in rural areas, indicated the possibility of rural elderly patients being admitted more frequently than their city counterparts and/or a

Figure 7

Trends in Elderly ALOS for Metropolitan, Regional and Rural Areas



greater number of repeat admissions for the same illness episode or a growing number of referrals to metropolitan hospitals from rural areas may have produced the lower ALOS for rural areas.

2) From 1971 to 1981/82, metropolitan areas had experienced decreasing trends in SEPRATEs, PDAYRATEs and ALOS. Moreover, whereas ALOS and PDAYRATEs have notably decreased over the years in regional areas, the trend has been toward gradually increasing SEPRATEs. For rural areas, elderly SEPRATEs and PDAYRATEs have increased between 1971 and 1976 and decreased between 1976 and 1981/82; however, ALOS has remained relatively stable. The decreasing trends in ALOS over the years in metropolitan areas and the relative stability of ALOS in rural areas may have reflected a growing trend to transfer rural elderly patients from metropolitan hospitals to rural hospitals for further recovery requiring nursing care needs.

3) ALOS for the elderly population in rural areas has exceeded elderly ALOS in regional areas since 1977. An explanation for this was not obvious.

The results regarding hospital utilization rates by the elderly in metropolitan, regional and rural areas generally confirmed research expectations. Thus, the findings provided indirect support to the premise that determinants of hospital utilization by the elderly differ between these three areas. Nevertheless, the findings suggested that, for

regional and rural areas, determinants related to elderly SEPRATEs and PDAYRATEs exhibit some similarities; however, determinants associated with elderly ALOS tend to be more similar between metropolitan and regional areas than that of rural areas.

4.4.3 Calgary, Edmonton, Grande Prairie, Lethbridge, Medicine Hat and Red Deer Regions

Analysis of elderly SEPRATEs according to the six specified geographic regions indicated that the regions from highest to lowest overall SEPRATEs were Grande Prairie, Red Deer, Lethbridge, Edmonton, Medicine Hat, and Calgary, having 633, 481, 464, 442, 415, and 330 separations per 1000 elderly person-years, respectively, overall (Table 10). Throughout the years, northern regions, Edmonton and Grande Prairie, and extreme southern regions, Lethbridge and Medicine Hat, exhibited elderly SEPRATEs which were consistently above the provincial rate. In contrast, the elderly SEPRATEs for the Calgary region were consistently and significantly below the provincial rate. Of note was the fact that the Grande Prairie region SEPRATEs exceeded those of the rural areas (as discussed in section 4.4.2). Whereas trends toward increasing elderly SEPRATEs over the years were noted for the Grande Prairie and Medicine Hat regions, the trend was toward decreasing SEPRATEs for the Edmonton region (perhaps denoting a trend toward more selective admissions in the Edmonton region).

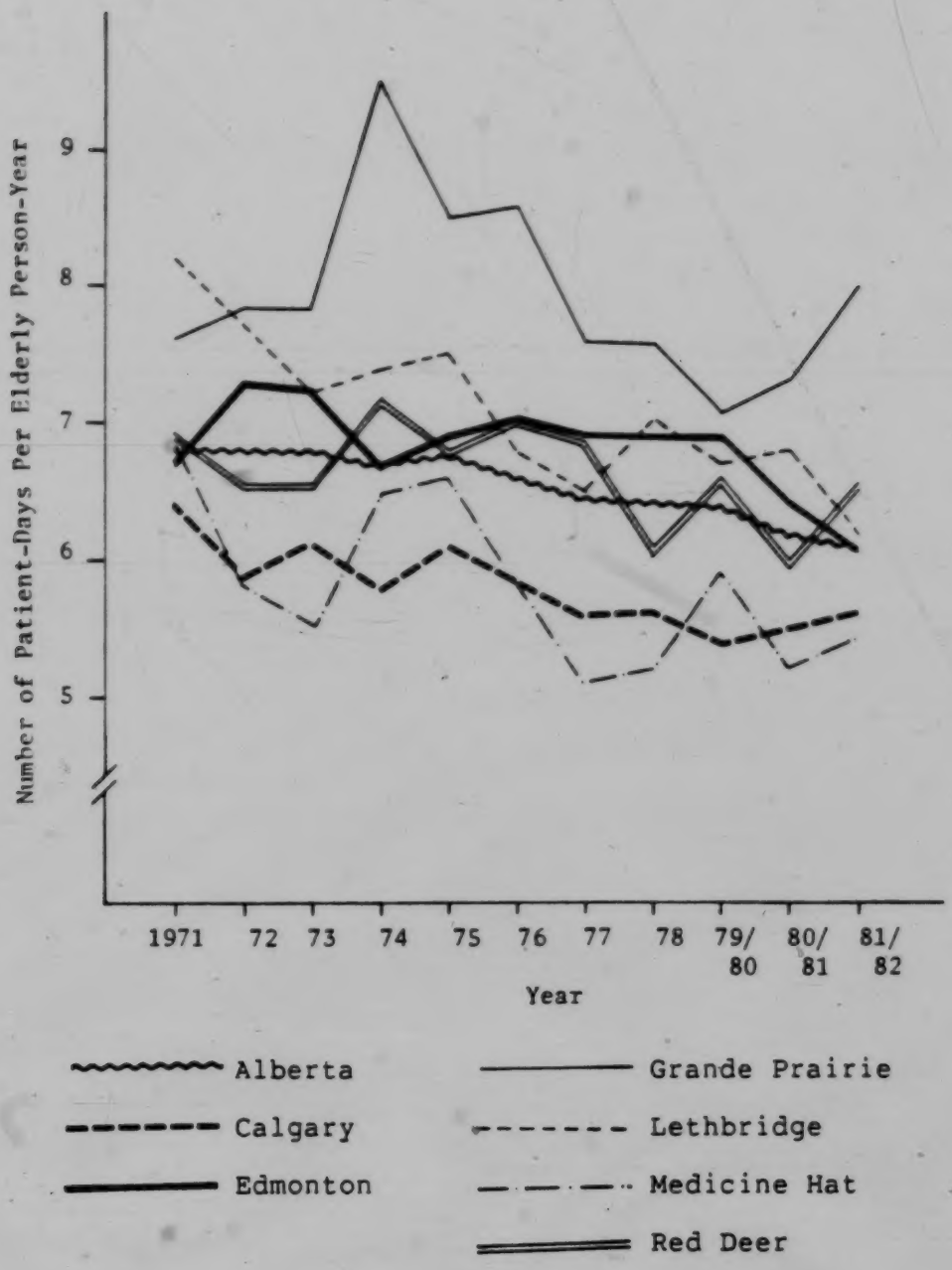
Research findings regarding elderly PDAYRATEs for the six regional areas differed somewhat from those of the SEPRATEs. The highest overall elderly PDAYRATE was noted for the Grande Prairie region (7.9 patient-days per elderly person-year), and the lowest PDAYRATEs were recorded for the Calgary and Medicine Hat regions, each averaging 5.8 patient-days per elderly person-year, during the eleven year study period (Table 12). Whereas the elderly PDAYRATEs for the Red Deer and Lethbridge regions tended to be similar to those of the Edmonton region, the PDAYRATEs of the Medicine Hat region were generally similar to those of the Calgary region. In contrast, the Grande Prairie region rates tended to be representative of rural area elderly PDAYRATEs.

Examination of trends in elderly PDAYRATEs over time indicated general declining trends from most regions, with Lethbridge and Medicine Hat demonstrating the largest degreases between 1971 and 1981/82, 24.4 and 21.7 percent, respectively (Figure 8). Comparison of the PDAYRATEs to the 1971 base rate confirmed these and the previous findings (Table 13).

Overall elderly ALOS figures revealed that, in decreasing order of ALOS, the regions were Calgary, Edmonton, Lethbridge, Medicine Hat, Red Deer, and Grande Prairie, with the corresponding overall figures being 17.5, 15.4, 15.2, 14.0, 13.7, and 12.5 patient-days per elderly separation (Table 14). Of note was the fact that the elderly ALOS for the Medicine Hat and Red Deer regions was similar

Figure 8

Trends in Elderly PDAYRATEs for Regional Areas



to the elderly ALOS for the rural regions. Trend analysis identified generally declining trends for all regions except Edmonton, wherein the ALOS has remained relatively stable over the years (Figure 9). Between 1971 and 1981/82, the largest decrease in ALOS was noted for the Lethbridge and Medicine Hat regions, a decrease of 4.4 patient-days each.

In general, the observed hospital utilization rates for the elderly population according to the six regional areas suggested that the Calgary region may have had more selective elderly admissions than any other region. Moreover, the high SEPRATEs and PDAYRATEs, in combination with low ALOS for the Grande Prairie region implied the occurrence of many repeat elderly admissions.

The foregoing research findings suggested that regions with high elderly SEPRATEs and PDAYRATEs accommodated this demand by decreasing the ALOS of the elderly in acute care hospitals. In areas where the elderly SEPRATEs and PDAYRATEs for the elderly were relatively low, the ALOS tended to be relatively higher.

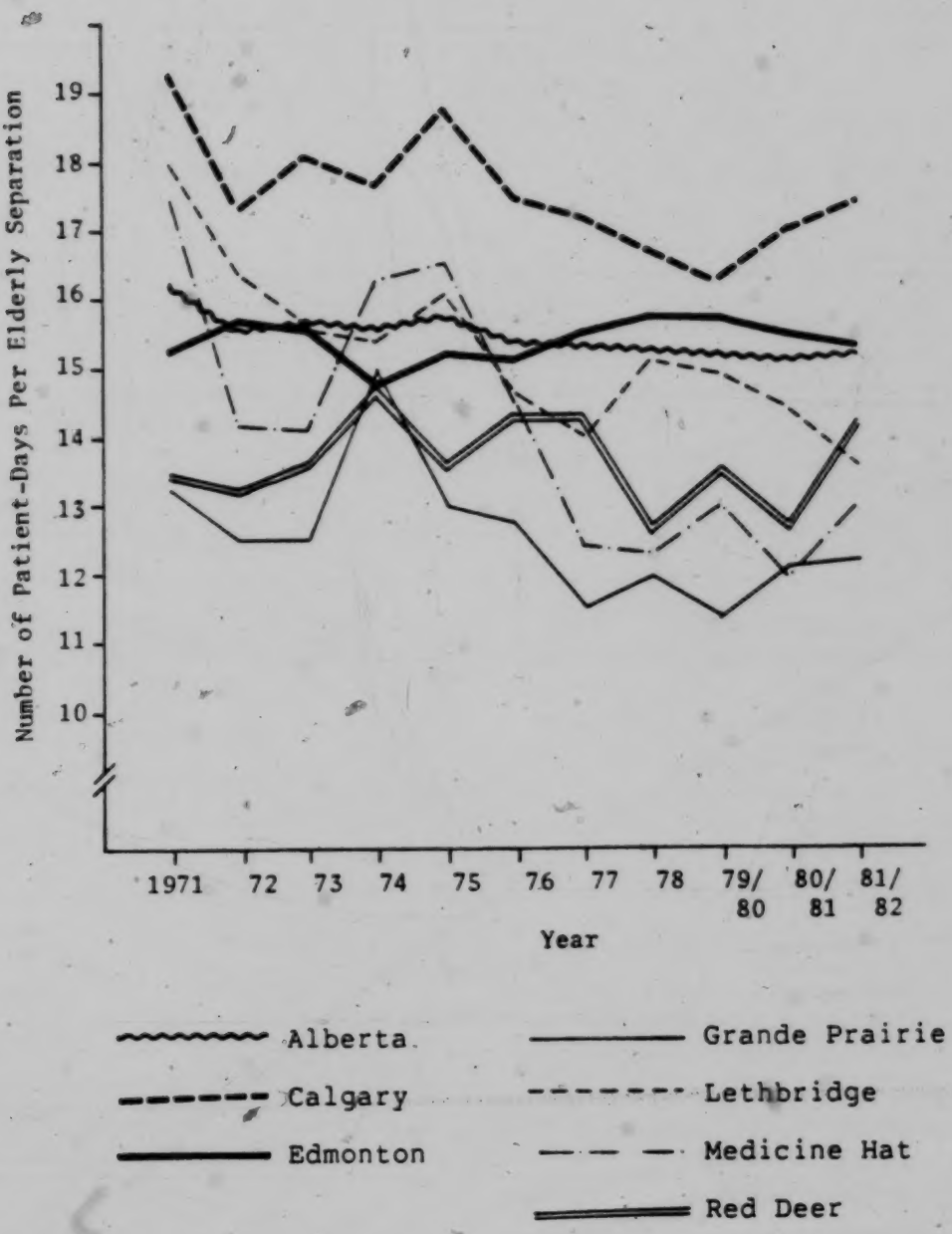
4.4.4 Summary of Findings

The major findings of the analysis of regional variations in hospital utilization rates by the elderly population were as follows:

1) From 1971 to 1981/82, elderly SEPRATEs and PDAYRATEs were higher for the Metro-Edmonton district as compared to Metro-Calgary; however, ALOS tended to be higher for

Figure 9

Trends in Elderly ALOS for Regional Areas



the Metro-Calgary district. Furthermore, whereas SEPRATEs and PDAYRATEs were consistently below the yearly provincial rate for both districts, the ALOS was above the provincial rate for both districts. All utilization rates for these districts exhibited a trend toward decreasing rates over the years. The operative influence of selective admissions, per capita bed supply factors, and/or level of care availability were advanced as plausible explanations for these findings.

2) Whereas metropolitan areas demonstrated low elderly SEPRATEs and PDAYRATEs, and high ALOS; rural areas tended to exhibit high SEPRATEs and PDAYRATEs, but low ALOS. Regional areas were observed to have intermediate elderly SEPRATEs, low PDAYRATEs (similar to metropolitan areas), and low ALOS (similar to rural areas). SEPRATEs and PDAYRATEs were above the provincial rate only for rural areas, and ALOS was above the provincial rate only for metropolitan areas. Although utilization rates tended to decrease over time for metropolitan and regional areas, for rural areas they had remained relatively stable. These findings suggested the possibility of more frequent admissions and/or a greater number of repeat admissions for the same illness episode for rural elderly.

3) High rates of hospital utilization by the elderly were observed for the Grande Prairie region and low hospitalization rates were characteristic of the

Calgary region. The Lethbridge region also demonstrated relatively high rates of hospital utilization by the elderly. Although the reasons for the observed variation in utilization rates according to the six regions were not immediately obvious, differences in per capita acute care or long-term care bed supply or repeat admissions may have accounted for the observed variations. In particular, the Grande Prairie region warrants further study.

In total, these findings implied that heavy utilization of acute care hospital beds by the elderly tended to be a rural phenomenon. Perhaps the inadequate supply of alternative sources of health care (for example, nursing home or long-term care beds, or home care programs) in rural areas may have contributed to these utilization patterns.

4.5 Patient Origin-Destination Analyses

An examination of hospital care-seeking patterns by the elderly in Alberta was conducted from a community (district) perspective and a provider (hospital) perspective by means of patient origin-destination analyses. All patient origin-destination matrices involved the aggregation of data for the 65 year and over age group and the analyses were performed for years 1971, 1976 and 1981/82, as well as for all years combined. The research findings, according to the two investigational perspectives, are presented in the following sections.

4.5.1 Community (District) Perspective - Relevance Indices

The degree to which elderly patients remained within or left their district of residence to receive hospital care was estimated by calculation of relevance indices (RIs) for selected groups of hospital districts. The districts were clustered accordingly in order to indirectly assess the influence of the following two factors on elderly patients' care-seeking movement patterns: (1) the level of hospital care availability as represented by metropolitan, regional and rural areas; and (2) the geographic location of the region of residence within the province. The results of the analyses according to the two community (district) perspectives are presented and discussed herein.

Metropolitan, Regional and Rural Areas

Examination of RIs for metropolitan, regional and rural areas revealed that, although most elderly patients received care in hospitals located within their area of residence, the tendency to remain within an area increased as the district's level of urbanization and availability of higher levels of care increased. This was reflected in the finding that, for all years combined, the RIs for metropolitan, regional and rural areas to the elderly residents of their own area were 97.6, 84.3 and 78.8 percent, respectively, in terms of SEPS, and 98.3, 83.8 and 76.5 percent, respectively, in terms of PDAYS (Table 15). These results were in concurrence with the literature findings identifying the importance of distance minimization to care facility

Table 15

Trends in RIs[1] and ALOS for Metropolitan, Regional and Rural Areas

Utilization Measure	Area of Origin	Patient Destination: Metropolitan Hospitals 1971	1976	1981/82	1971-81/82	Regional Hospitals 1971	1976	1981/82	1971-81/82	Rural Hospitals 1971	1976	1981/82	1971-81/82
SEPS %	Metropolitan	97.6	97.7	97.7	97.6	0.2	0.2	0.2	0.1	2.2	2.2	2.1	2.2
	Regional	5.5	6.7	7.3	7.1	85.4	84.4	85.2	84.3	9.1	8.9	7.5	8.6
	Rural	15.8	17.5	18.9	17.7	3.1	3.1	4.2	3.5	81.1	79.4	76.9	78.8
PDAYS %	Metropolitan	98.4	98.6	98.4	98.3	0.1	0.1	0.1	0.1	1.5	1.3	1.6	1.6
	Regional	6.4	7.5	7.5	8.0	85.2	82.5	86.1	83.8	8.4	10.0	6.5	8.3
	Rural	19.0	20.0	19.0	20.2	3.5	2.9	3.2	3.3	77.5	77.2	77.8	76.5
ALOS [2]	Metropolitan	19.4	18.1	17.4	18.2	11.9	11.2	8.7	10.2	12.7	11.0	12.6	13.2
	Regional	18.8	16.2	13.5	16.0	16.1	14.1	13.3	14.1	14.9	16.3	11.4	13.6
	Rural	17.5	16.1	14.5	16.1	16.5	13.1	11.2	13.3	13.9	13.7	14.6	13.8

[1] Calculated, in terms of percentages, for elderly SEPS and PDAYS. Theoretically, the sum of RIs over all hospitals for a given district and year is 100% (rounding off error may result in slight deviation from 100%).

[2] Average length of stay is given in terms of the number of patient-days per elderly separation.

when seeking health services (Romeril, 1984; Studnicki, 1975; Toll, 1982). Furthermore, the observation that RIs were highest for metropolitan areas, lower for regional areas, and lowest for rural areas was expected, in that, whereas the availability of all levels of health care in metropolitan areas would minimize the need for travel outside the district, the presence of only primary level care in rural districts would result in relatively greater need to travel outside the area to receive higher levels of care. Contrary to the general trend toward a decreasing tendency of rural elderly residents to receive care in rural hospitals, the tendency for metropolitan and regional elderly residents to receive care in hospitals located in their own area of residence has remained relatively stable.

Elderly rural residents who travelled outside the rural areas to receive hospital care travelled primarily to metropolitan hospitals (17.7 and 20.2 percent SEPS and PDAYS, respectively, overall) as opposed to regional hospitals (3.5 and 3.3 percent SEPS and PDAYS, respectively, overall). In contrast, elderly regional residents who sought care outside the regional area travelled either to rural hospitals (8.6 and 8.3 percent SEPS and PDAYS, respectively, overall), or to metropolitan hospitals (7.1 and 8.0 percent SEPS and PDAYS, respectively, overall). These care-seeking patterns were consistent with those of the pediatric population in Alberta (Romeril, 1984). The relatively small proportion of elderly metropolitan residents who sought care

in rural hospitals probably resided on the outskirts of the metropolitan districts and either chose to travel to or were referred to smaller nearby rural hospitals. The even smaller proportion of elderly metropolitan residents seeking care in regional hospitals could possibly be accounted for by falling ill when visiting or vacationing the regional districts. Trend analysis revealed: (1) an increasing tendency, over time, for elderly regional residents to seek care in metropolitan hospitals, thereby, a decreasing tendency for these residents to travel to rural hospitals; and (2) a trend toward increasing tendency for rural residents to travel to metropolitan hospitals.

The increase in rural elderly to receive care in metropolitan hospitals may have been related to physician referral patterns or an inadequate supply of hospital beds or physicians in rural areas. In a study of pediatric utilization patterns in Alberta, Romeril (1984) reported an increasing trend for rural children to seek care in metropolitan hospitals and postulated that this may have been due to rural beds being increasingly occupied by the elderly or by patients with chronic care needs. Although the foregoing results of this study do not substantiate Romeril's (1984) plausible explanation, the results do, however, reveal the occurrence of a similar rural-to-metropolitan area trend in care-seeking behavior for the elderly, as that reported for pediatric cases.

Analysis of ALOS for the elderly residents of metropolitan, regional and rural areas by the respective hospitals in which care was sought indicated that elderly metropolitan residents hospitalized in metropolitan hospitals had longer overall ALOS (18.2 patient-days per separation) than regional residents receiving care in regional hospitals (14.1 patient-days per separation) or rural residents hospitalized in rural hospitals (13.8 patient-days per separation) (Table 15). As expected, elderly residents of all districts receiving care in metropolitan hospitals demonstrated, comparatively, the highest ALOS of all hospitals. Except for the fluctuating trend in the ALOS for residents of all districts receiving care in rural hospitals, the trend has been toward decreasing ALOS over time. Of note was the fact that elderly metropolitan residents hospitalized in metropolitan hospitals had a higher ALOS than regional or rural elderly hospitalized in metropolitan hospitals. This finding may have been attributed to earlier discharge and transfer of regional and rural elderly from metropolitan hospitals to hospitals located within the patients' district of residence, or to more selective admissions and conservative care of patients who travelled long distances to receive care.

In overview, the foregoing research findings indicated that:

1) Regardless of the level of care available within the

area of the patients' residence, most elderly patients tended to remain within their own area to receive hospital care.

2) Whenever seeking care in hospitals located beyond the area of a patients' residence, rural elderly residents tended to bypass regional hospitals and travel primarily to metropolitan hospitals.

3) Regional elderly residents were as equally likely to travel to metropolitan hospitals as to rural hospitals, when seeking care outside of regional areas.

Physician referral patterns or the geographic network of major road transportation routes may have accounted for some of the the observed findings. The travel patterns of elderly metropolitan and regional residents to rural hospitals may have been due to the unavailability of beds in metropolitan and regional hospitals, respectively, for the primary level care needs of the elderly in these areas. Furthermore, the tendency for rural elderly residents to bypass regional hospitals suggested the possibility of regional hospitals not functioning in a regional role capacity. Nevertheless, it was suspected that the configuration of major transportation routes in the province, as well as medical referral patterns would have accounted for this observation to a larger degree.

Geographic Regions

The calculated RIs for the six geographic regions by the six regional hospital areas are presented in Table 16.

Table 16
Trends in RIs[1] and ALOS for Six Regional Areas

Utilization Measure	Region of Area	Patient Destination - Hospitals: Calgary Region 1971	Calgary Region 1976	Calgary Region 1981/82	Calgary Region 1971-81/82	Edmonton Region 1971	Edmonton Region 1976	Edmonton Region 1981/82	Edmonton Region 1971-81/82	Grande Prairie Region[2] 1971	Grande Prairie Region[2] 1976	Grande Prairie Region[2] 1981/82	Grande Prairie Region[2] 1971-81/82
SEPS %	Calgary	98.3	97.4	97.8	97.8	0.6	0.9	0.6	0.8	0.0	0.1	0.1	0.0
	Edmonton	1.9	1.7	1.9	1.8	97.5	97.7	97.5	97.6	0.1	0.2	0.2	0.2
	Grande Prairie	0.5	0.3	0.5	0.4	12.6	14.7	12.7	14.5	86.9	84.8	86.6	85.1
	Lethbridge	6.1	6.5	8.7	7.8	1.0	0.8	0.5	0.8	-	0.0	0.0	0.0
	Medicine Hat	3.4	5.3	7.7	5.5	0.7	0.3	0.8	0.7	0.0	-	0.1	0.1
	Red Deer	3.5	3.6	4.9	4.3	12.0	10.3	9.9	10.7	-	0.1	0.1	0.1
PDAYS %	Calgary	98.8	98.1	98.6	98.4	0.5	0.7	0.4	0.6	0.0	0.1	0.0	0.0
	Edmonton	1.7	1.6	2.3	1.6	97.9	98.1	97.4	98.0	0.1	0.1	0.1	0.1
	Grande Prairie	0.4	0.2	0.3	0.4	17.0	17.8	14.6	18.0	82.6	81.6	84.9	81.5
	Lethbridge	6.6	7.4	9.8	8.8	1.0	0.7	0.4	0.9	-	0.0	0.0	0.0
	Medicine Hat	5.3	6.9	15.0	7.6	0.5	0.2	0.8	0.7	0.0	-	0.0	0.0
	Red Deer	5.2	4.9	4.7	5.6	16.6	11.2	9.2	12.1	-	0.1	0.0	0.1
ALOS [3]	Calgary	19.7	17.8	17.7	17.7	16.9	13.9	12.6	14.9	3.7	9.7	8.0	7.8
	Edmonton	13.9	13.9	18.6	13.9	15.3	15.2	15.3	15.5	6.6	9.6	9.7	9.7
	Grande Prairie	11.9	9.5	8.1	13.9	17.8	15.5	14.0	15.6	12.5	12.3	11.9	12.0
	Lethbridge	19.7	16.7	15.1	17.1	18.0	13.0	11.2	16.6	-	4.5	2.0	6.4
	Medicine Hat	25.9	19.0	25.3	19.2	13.1	9.0	13.3	13.4	5.0	-	2.5	6.8
	Red Deer	19.7	19.2	13.6	17.7	18.5	15.5	13.3	15.5	-	7.2	4.8	11.6

1 Calculated, in terms of percentages, for elderly SEPS and PDAYS. Theoretically, the sum of RIs over all hospitals for a given district and year is 100% (rounding off error may result in slight deviation from 100%).

2 The complete absence of SEPS or PDAYS is indicated by "-." The occurrence of a relatively small number of SEPS or PDAYS (that approaching zero) is indicated by "0.0."

3 Average length of stay is given in terms of the number of patient-days per elderly separation.

Table 16 Continued

Utilization Measure	Region of Area	Patient Destination - Hospitals: Lethbridge Region 1971	Lethbridge Region 1976	Lethbridge Region 1981/82	Lethbridge Region 1971-81/82	Medicine Hat Region 1971	Medicine Hat Region 1976	Medicine Hat Region 1981/82	Medicine Hat Region 1971-81/82	Red Deer Region 2 1971	Red Deer Region 2 1976	Red Deer Region 2 1981/82	Red Deer Region 2 1971-81/82
SEPS %	Calgary	0.4	0.5	0.5	0.4	0.2	0.4	0.4	0.4	0.5	0.7	0.7	0.6
	Edmonton	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.3	0.4	0.4
	Grande Prairie	0.0	0.1	0.0	0.0	-	-	-	0.0	0.0	0.1	0.1	0.1
	Lethbridge	92.7	92.5	90.4	91.1	0.1	0.2	0.3	0.1	0.1	0.1	0.0	0.1
	Medicine Hat	4.1	2.1	2.1	2.7	91.6	92.2	89.4	90.9	0.0	0.1	-	0.1
	Red Deer	0.1	0.1	0.1	0.1	-	0.0	0.0	0.0	84.3	85.8	85.1	84.9
PDAYS %	Calgary	0.2	0.4	0.2	0.3	0.0	0.2	0.2	0.2	0.3	0.5	0.5	0.4
	Edmonton	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.3
	Grande Prairie	0.0	0.0	0.0	0.0	-	-	-	0.0	0.0	0.3	0.1	0.1
	Lethbridge	92.2	91.7	89.6	90.1	0.1	0.1	0.2	0.1	0.1	0.0	0.0	0.0
	Medicine Hat	4.2	2.0	1.6	2.8	90.0	90.8	82.6	88.9	0.0	0.0	-	0.0
	Red Deer	0.1	0.0	0.0	0.0	-	0.0	0.0	0.0	78.1	83.8	86.0	82.2
ALOS 3	Calgary	13.5	14.3	8.1	11.7	8.4	9.6	9.6	10.4	12.2	13.0	12.9	11.8
	Edmonton	10.0	10.3	6.3	9.7	12.3	6.0	7.2	7.8	8.6	10.5	9.1	10.3
	Grande Prairie	2.0	18.7	5.0	10.4	-	-	-	4.5	3.0	33.4	12.0	13.6
	Lethbridge	17.9	14.5	13.4	15.0	15.8	9.3	8.2	10.3	12.5	12.7	6.0	9.1
	Medicine Hat	17.9	14.0	10.2	14.2	17.1	14.3	12.0	13.6	2.0	6.0	-	7.5
	Red Deer	12.0	8.5	5.8	9.9	-	17.5	13.5	12.8	12.4	14.0	14.4	13.2

1 Calculated, in terms of percentages, for elderly SEPS and PDAYS. Theoretically, the sum of RI's over all hospitals for a given district and year is 100% (rounding off error may result in slight deviation from 100%).

2 The complete absence of SEPS or PDAYS is indicated by "-." The occurrence of a relatively small number of SEPS or PDAYS (that approaching zero) is indicated by "0.0."

3 Average length of stay is given in terms of the number of patient-days per elderly separation.

Concurrent with expectations, most elderly patients tended to be treated in hospitals located within their own region of residence. This finding supported that of other investigators (Romeril, 1984; Sharp & McCarthy, 1971). With regard to the tendency of elderly patients to seek care in their own region, highest overall RIs, in terms of both SEPS and PDAYS, were noted for the Edmonton and Calgary regions, with the Lethbridge and Medicine Hat regions exhibiting slightly lower RIs, and the Grande Prairie and Red Deer regions having the lowest RIs. Over time, the tendency of elderly residents in the Lethbridge and Medicine Hat regions to receive care in hospitals located within their own region of residence had demonstrated a declining trend; however, the tendency of elderly residents in the Red Deer region to be treated in hospitals located in the same region had increased.

Analysis of elderly patients' care-seeking travel patterns to hospitals located outside the patients' region of residence revealed that, although relatively small in proportion, elderly residents of the Calgary region tended to travel to Edmonton, Lethbridge and Red Deer region hospitals. In comparison, elderly residents of the Edmonton region sought care in Calgary region hospitals. Whereas elderly residents of both the Lethbridge and Medicine Hat regions travelled outside their own region mainly to Calgary region hospitals, residents of the Grande Prairie and Red Deer regions sought care mainly in Edmonton region hospitals

when seeking care outside their own region of residence. For elderly residents of the Grande Prairie, Lethbridge and Medicine Hat regions, the travel patterns outside their community of residence had exhibited a trend toward increasing tendencies over the years. Of noteworthy observation, however, was the decreasing trend in the tendency of the elderly residents of the Red Deer region to seek care in Edmonton region hospitals; this was compensated by the trend toward increasing RIs for SEPS and decreasing RIs for PDAYS for Calgary region hospitals.

For the six regional areas, ALOS was compared between elderly residents remaining within their own region and those residents travelling outside their region of residence to seek hospital care. For those elderly residents remaining within their region of residence, in decreasing order of overall ALOS the regions were Calgary, Edmonton, Lethbridge, Medicine Hat, Red Deer, and Grande Prairie, with the corresponding ALOS being 17.7, 15.5, 15.0, 13.6, 13.2, and 12.0 patient-days per separation, respectively (Table 16). Elderly residents seeking care in Edmonton or Calgary region hospitals demonstrated a higher ALOS than in their home district. This was expected on the assumption that they travelled to Edmonton or Calgary to receive a higher level of service for more complex diseases or disabilities. Examination of trends in ALOS indicated that, for residents remaining within their own region, the ALOS had declined over time, except for Edmonton region residents for whom the

ALOS had remained relatively stable, and for Red Deer region residents, for whom ALOS had increased in Red Deer region hospitals. Except for the increasing trend toward higher ALOS for Edmonton elderly residents seeking care in Calgary region hospitals, for most other residents travelling outside their region of residence to receive hospital care the trend had been toward decreasing ALOS over the years.

In summary, the RIs according to the six geographic regions ascertained that:

1) The overall relative mobility of the elderly population in seeking hospital care throughout the province was quite low. As such, the level of service available within a particular region would have seemed to be sufficiently suitable to service the elderly residents of that region.

2) For all elderly residents of regions other than Calgary and Edmonton, any notable travel patterns were to the nearest Edmonton or Calgary region.

These results indicated the operative influence of some degree of distance minimization when seeking care outside one's region of residence. The relatively low hospital care-seeking mobility of elderly residents in the province would imply, based on the findings of this study, that their care needs were mainly for primary and secondary level care.

4.5.2 Provider (Hospital) Perspective - Commitment Indices

The relative extent to which a particular group of hospitals (provider) rendered acute care services to elderly patients residing within or outside the district, area or region in which the hospitals were located were ascertained by computing commitment indices (CIs) for selected groups of hospitals. Origin-destination matrices according to the provider perspective were analyzed for: (1) hospitals clustered by levels of care namely, metropolitan, regional and rural hospitals; (2) hospital groups for the six provincial geographic regions; and (3) Metro-Calgary and Metro-Edmonton hospital groups. The related research findings are presented herein.

Metropolitan, Regional and Rural Hospitals

Analysis of CIs for metropolitan, regional and rural hospitals to the elderly residents of their respective home district revealed that the lower the level of care available within a hospital group, the higher the service commitment, in terms of SEPS and PDAYS, to the elderly residents of the home district. In this regard, metropolitan hospitals demonstrated the lowest commitment (75.2 percent SEPS and 77.4 percent PDAYS, overall) to the elderly residents of metropolitan districts; regional hospitals had a higher service commitment (81.1 percent SEPS and 82.1 percent PDAYS, overall) to regional elderly residents; and rural hospitals were almost entirely committed (96.5 percent SEPS and 96.6 percent PDAYS, overall) to rural elderly residents

(Table 17).

This finding was consistent with that reported by Sharp and McCarthy (1971) who observed that rural hospitals tended to provide services to rural residents approximately 98 percent of the time. Romeril's (1984) findings of pediatric utilization were similar. Whereas the trend in the service commitment of metropolitan and regional hospitals to the elderly residents of their home district tended toward a declining commitment over time, the commitment of rural hospitals to elderly rural residents had remained relatively stable, or perhaps tended toward a slight increase, over the three years examined. In contrast to the foregoing findings of a decreasing commitment, in terms of SEPS and PDAYS, to the elderly residents of the home district as the level of care of a hospitals group increases, ALOS findings suggested that the higher the level of care available in a hospital group, the higher the ALOS for the elderly residents of the home district. Accordingly, ALOS was highest for metropolitan hospitals serving the residents of metropolitan districts (18.2 patient-days per separation) and lowest for rural hospitals delivering service to elderly rural residents (13.8 patient-days per separation). The high ALOS for metropolitan elderly in metropolitan hospitals may have been due to selective admissions.

With regard to serving elderly residents of outside districts, the service commitment of both metropolitan and regional hospital groups was highest to the elderly

Table 17
Trends in CIs[1] and ALOS for Metropolitan, Regional and Rural Hospitals

Utilization Measure	Hospital of Patient Destination	Patient Origin: Metropolitan Districts 1971	1976	1981/82	1971-81/82	Regional Districts 1971	1976	1981/82	1971-81/82	Rural Districts 1971	1976	1981/82	1971-81/82
SEPS %	Metropolitan	77.3	75.7	74.2	75.2	1.3	1.5	1.8	1.7	21.4	22.8	24.0	23.1
	Regional	0.5	0.6	0.4	0.5	82.1	82.4	79.5	81.1	17.4	17.0	20.0	18.4
	Rural	1.5	1.6	1.6	1.6	1.9	1.9	1.8	1.9	96.6	96.5	96.6	96.5
PDAYS %	Metropolitan	78.9	77.8	77.7	77.4	1.3	1.4	1.5	1.5	20.8	20.8	20.9	21.0
	Regional	0.4	0.5	0.3	0.3	81.9	83.5	82.2	82.1	16.0	16.0	17.5	17.6
	Rural	1.4	1.3	1.4	1.5	2.0	2.3	1.4	1.9	96.5	96.5	97.2	96.6
ALOS [2]	Metropolitan	19.4	18.1	17.4	18.2	18.8	16.2	13.5	16.0	16.1	16.1	14.5	16.1
	Regional	11.9	11.2	8.7	10.2	16.1	14.1	13.3	14.1	13.1	13.1	11.2	13.3
	Rural	12.7	11.0	12.6	13.2	14.9	16.3	11.4	13.6	13.7	13.7	14.6	13.8

1 Calculated, in terms of percentages, for elderly SEPS and PDAYS. Theoretically, the sum of CIs over all districts for a given hospital and year is 100% (rounding off error may result in slight deviations from 100%).

2 Average length of stay is given in terms of the number of patient-days per elderly separation.

residents of rural districts. Presumably, this reflected the closer proximity, in distance, of rural districts to metropolitan and regional hospitals, as opposed to the farther distance of regional districts to metropolitan hospitals.

In brief summary, the CIs for metropolitan, regional and rural hospitals to the elderly residents of metropolitan, regional and rural areas revealed that:

1) The higher the level of care available within a hospital group, the lower the service commitment to the elderly residents of the home area, and the higher the ALOS; thereby, implying a higher referral center role and more selective admissions for metropolitan hospitals.
2) Whereas the service commitment of metropolitan and regional hospitals to the elderly residents of the home district declined over the years; it had remained relatively stable for rural hospitals serving elderly rural residents.

Geographic Regions

Commitment indices for the hospitals located in the six regional areas in the province revealed that the commitment of SEPS and PDAYS of all hospital groups to the elderly residing within their region was substantially high, ranging from 91.0 percent SEPS and 91.8 percent PDAYS (Calgary region) to 98.1 percent SEPS and 98.5 percent PDAYS (Grande Prairie region), overall (Table 18). Whereas the service

Table 18
Trends in CIs[1] and ALOS for Hospital Groups of Six Regions

Utilization Measure	Hospital of Patient Destination	Patient Origin: Calgary Region 1971	Calgary Region 1976	Calgary Region 1981/82	Calgary Region 1971-81/82	Edmonton Region 1971	Edmonton Region 1976	Edmonton Region 1981/82	Edmonton Region 1971-81/82	Grande Prairie Region[2] 1971	Grande Prairie Region[2] 1976	Grande Prairie Region[2] 1981/82	Grande Prairie Region[2] 1971-81/82
SEPS %	Calgary	92.2	91.7	90.2	91.0	3.6	3.5	3.3	3.4	0.1	0.0	0.1	0.1
	Edmonton	0.3	0.4	0.3	0.3	95.3	95.5	95.7	95.4	1.8	2.0	1.9	2.0
	Grande Prairie	0.1	0.6	0.2	0.2	0.9	1.7	1.5	1.5	98.9	97.5	98.1	98.1
	Lethbridge	1.1	1.1	1.2	1.0	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.0
	Medicine Hat	1.6	3.2	3.0	2.8	0.3	0.2	0.2	0.2	-	-	-	0.0
	Red Deer	1.3	2.0	2.0	1.9	2.5	1.7	2.1	2.3	0.0	0.1	0.1	0.1
PDAYS %	Calgary	93.1	92.5	90.6	91.8	2.6	2.8	3.5	2.7	0.1	0.0	0.1	0.1
	Edmonton	0.3	0.4	0.3	0.3	94.6	95.5	96.2	95.4	2.0	2.1	1.8	2.0
	Grande Prairie	0.0	0.4	0.1	0.1	0.5	1.3	1.2	1.2	99.5	98.1	98.6	98.5
	Lethbridge	0.8	1.1	0.7	0.8	0.0	0.1	0.1	0.1	0.0	0.1	0.0	0.0
	Medicine Hat	0.8	2.2	2.4	2.2	0.2	0.1	0.1	0.1	-	-	-	0.0
	Red Deer	1.3	1.8	1.8	1.7	1.7	1.3	1.3	1.8	0.0	0.3	0.1	0.1
ALOS [3]	Calgary	19.7	17.8	17.7	17.7	13.9	13.9	18.6	13.9	11.9	9.5	8.1	13.9
	Edmonton	16.9	13.9	12.6	14.9	15.3	15.2	15.3	15.5	17.8	15.5	14.0	15.6
	Grande Prairie	3.7	9.7	8.0	7.8	6.6	9.6	9.7	9.7	12.5	12.3	11.9	12.0
	Lethbridge	13.5	14.3	8.1	11.7	10.0	10.3	6.3	9.7	2.0	18.7	5.0	10.4
	Medicine Hat	8.4	9.6	9.6	10.4	12.3	6.0	7.2	7.8	-	-	-	4.5
	Red Deer	12.2	13.0	12.9	11.8	8.6	10.5	9.1	10.3	3.0	33.4	12.0	13.6

1 Calculated, in terms of percentages, for elderly SEPS and PDAYS. Theoretically, the sum of CIs over all regions for a given hospital and year is 100% (rounding off eror may result in slight deviations).

2 The complete absence of SEPS or PDAYS is indicated by "-." The occurrence of a relatively small number of SEPS or PDAYS (that approaching zero) is indicated by "0.0."

3 Average length of stay is given in terms of the numbers of patient-days per elderly separation.

Table 18 Continued

Utilization Measure	Hospital of Patient Destination	Patient Origin: Lethbridge Region 1971	Lethbridge Region 1976	Lethbridge Region 1981/82	Lethbridge Region 1971-81/82 [2]	Medicine Hat Region 1971	Medicine Hat Region 1976	Medicine Hat Region 1981/82	Medicine Hat Region 1971-81/82 [2]	Red Deer Region 1971	Red Deer Region 1976	Red Deer Region 1981/82	Red Deer Region 1971-81/82 [2]
SEPS %	Calgary	2.2	2.7	3.5	3.1	0.5	0.7	1.1	0.7	1.3	1.4	1.7	1.6
	Edmonton	0.2	0.2	0.1	0.2	0.0	0.0	0.1	0.0	2.3	1.9	1.9	2.0
	Grande Prairie	-	0.1	0.0	0.0	0.0	-	0.0	0.0	-	0.2	0.1	0.1
	Lethbridge	97.2	97.9	97.8	97.8	1.5	0.7	0.8	1.0	0.1	0.1	0.1	0.0
	Medicine Hat	0.4	0.5	0.8	0.5	97.7	95.9	95.8	96.4	-	0.1	0.1	0.1
	Red Deer	0.1	0.1	0.0	0.1	0.0	0.0	-	0.0	96.0	96.1	95.8	95.7
PDAYS %	Calgary	2.3	2.5	3.0	3.0	0.6	0.7	1.5	0.8	1.3	1.5	1.3	1.6
	Edmonton	0.2	0.1	0.1	0.2	0.0	0.0	0.1	0.0	2.8	1.9	0.7	2.0
	Grande Prairie	-	0.0	0.0	0.0	0.0	-	0.0	0.0	-	0.1	0.0	0.1
	Lethbridge	97.6	98.0	98.6	98.1	1.5	0.7	0.6	0.9	0.1	0.0	0.0	0.0
	Medicine Hat	0.4	0.3	0.6	0.4	98.6	97.2	96.8	97.8	-	0.1	0.1	0.1
	Red Deer	0.1	0.1	0.0	0.1	0.0	0.0	-	0.0	96.8	96.6	96.7	96.4
ALOS [3]	Calgary	19.7	16.7	15.1	17.1	25.9	19.0	25.3	19.2	19.7	19.2	13.6	17.7
	Edmonton	18.0	13.0	11.2	16.6	13.1	9.0	13.3	13.4	18.5	15.5	13.3	15.5
	Grande Prairie	-	4.5	2.0	6.4	5.0	-	2.5	6.8	-	7.2	4.8	11.6
	Lethbridge	17.9	14.5	13.4	15.0	17.9	14.0	10.2	14.2	12.0	8.5	5.8	9.9
	Medicine Hat	15.8	9.3	8.2	10.3	17.1	14.3	12.0	13.6	-	17.5	13.5	12.8
	Red Deer	12.5	12.7	6.0	9.1	2.0	6.0	-	7.5	12.4	14.0	14.4	13.2

[2] The complete absence of SEPS or PDAYS is indicated by "-." The occurrence of a relatively small number of SEPS or PDAYS (that approaching zero) is indicated by "0.0."

[3] Average length of stay is given in terms of the numbers of patient-days per elderly separation.

commitments of Calgary, Medicine Hat and Red Deer region hospital groups to the elderly residents of their own region had slightly declined over time, the CIs of Edmonton and Lethbridge region hospitals to the elderly residents of their own region demonstrated a slight increase over the same years. The commitment of the Grande Prairie region hospital group to the elderly residents of its own region, however, remained relatively stable.

Findings, regarding the service commitment of hospital groups to the elderly residents of regions other than the one in which the hospital group was located in, generally indicated, concurrent with expectations, that the secondary commitments were higher to those residents living in regions which surrounded the region in which the hospital group was located (Table 18). In this regard, Edmonton hospitals had secondary commitments to Grande Prairie and Red Deer regions; Calgary hospitals had secondary commitments to Lethbridge, Red Deer and Medicine Hat regions. An exception to this was the higher service commitment of the Calgary region hospitals group to treating the elderly residents of the Edmonton region, rather than the Red Deer region. Nevertheless, trend analysis revealed a trend toward increasing commitment to the Red Deer region and a decreasing commitment to Edmonton region residents.

The foregoing findings demonstrated that, as far as the treatment of elderly patients was concerned, the hospitals within a particular geographic region assumed a primary and

substantial service commitment to the elderly residents of their home district.

Metro-Calgary and Metro-Edmonton Hospitals

The computed CIs for grouped Metro-Calgary and Metro-Edmonton hospitals (destinations), employing Metro-Calgary, Metro-Edmonton, regional and rural districts as the origin vector, are presented for 1971, 1976, 1981/82, and all years combined in Table 19. The research findings indicated that the Metro-Calgary hospital group committed a significantly greater overall proportion of its elderly SEPS (84.5 percent) and PDAYS (85.7 percent) to the elderly residents living in the Metro-Calgary district than the Metro-Edmonton hospital group had committed (68.5 percent SEPS and 71.1 percent PDAYS) to the elderly residents of the Metro-Edmonton district. Generally, the noted yearly trend was toward a decreasing commitment of elderly SEPS and PDAYS to those elderly residents living within each of the metropolitan districts.

These findings suggested a greater patient inflow from nonmetropolitan areas into Metro-Edmonton hospital than into Metro-Calgary hospitals; therefore, a greater referral center role for the treatment of the elderly for Metro-Edmonton. This finding was consistent with the previous finding, by the district perspective of patient origin-destination analysis, indicating that a relatively substantial proportion of elderly patients from rural areas sought care in metropolitan hospitals (Table 15). The ALOS

Table 19
Trends in CIs* for Metro-Calgary and Metro-Edmonton Hospitals

Hospital of Patient Destination	Utilization Measure	Patient Origin: Metro-Calgary District 1971	1976	1981/82	1971-81/82	Metro-Edmonton District 1971	1976	1981/82	1971-81/82	Regional Districts 1971	1976	1981/82	1971-81/82	Rural Districts 1971	1976	1981/82	1971-81/82
Metro-Calgary	SEPS %	87.3	85.4	83.1	84.5	0.4	0.2	0.2	0.3	1.3	1.9	2.6	2.1	11.0	12.4	14.0	13.2
	PDAYS %	87.6	86.6	85.4	85.7	0.2	0.3	0.2	0.2	1.4	1.9	2.1	1.9	10.7	11.3	12.3	12.1
	ALOS	20.7	18.7	18.0	18.8	12.3	25.2	13.3	15.1	22.8	17.8	14.2	17.1	20.0	16.8	15.4	17.1
Metro-Edmonton	SEPS %	0.1	0.3	0.2	0.2	69.8	68.7	67.3	68.5	1.3	1.3	1.2	1.4	28.8	29.7	31.2	29.9
	PDAYS %	0.1	0.3	0.2	0.2	71.6	70.8	71.1	71.1	1.1	1.1	0.9	1.2	27.2	27.7	27.7	27.5
	ALOS	10.6	17.1	15.4	16.2	18.3	17.5	16.9	17.8	16.0	14.6	12.3	14.9	16.9	15.9	14.2	15.8

* Calculated, in terms of percentages, for elderly SEPS and PDAYS. Theoretically, the sum of all CIs over all districts for a given hospital and year is 100% (rounding off error may result in slight deviations from 100%).

for the Metro-Calgary hospital group serving elderly Metro-Calgary residents was higher, overall and for each of the years studied, than the ALOS for the Metro-Edmonton hospital group serving elderly Metro-Edmonton residents. Plausible explanations for this finding included the possibility of: (1) more selective elderly admissions with higher illness complexity, thereby higher ALOS, in Metro-Calgary hospitals; and/or (2) an inadequate supply of long-term beds in Metro-Calgary; and/or (3) more developed and effectively implemented home care programs in Metro-Edmonton facilitating earlier discharge.

With regard to serving elderly residents of outside districts, the service commitment of each of the Metro-Calgary and Metro-Edmonton hospital groups was greatest to the elderly residents of rural districts, considerably lower to the residents of regional districts, and lowest (minimal) to the elderly residents of the opposing metropolitan district. As such, these results were in accordance with those obtained by the district perspective. Whereas the service commitment, and therefore the allocation of acute care hospital resources, was relatively more than twice as great for the Metro-Edmonton hospital group to rural elderly residents (29.9 percent SEPS and 27.5 percent PDAYS, overall), than for the Metro-Calgary hospital group to the elderly residents living in rural districts (13.2 percent SEPS and 12.1 percent PDAYS, overall); the CI of the Metro-Calgary hospital group was

slightly higher than that of the Metro-Edmonton hospital group to the elderly residents of regional districts. This indicated a greater inflow of patients from regional districts to Metro-Calgary hospitals than to Metro-Edmonton hospitals. Accordingly, the results by the district perspective had indicated that elderly residents from three regional districts (Lethbridge, Medicine Hat and Red Deer) sought care in Calgary region hospitals, whereas elderly residents from mainly two regional districts (Grande Prairie and Red Deer) sought care in Edmonton region hospitals (Table 16).

For each of the metropolitan hospital groups, the noted trend was toward an increasing commitment of SEPS and PDAYS to rural elderly residents. In contrast to the trend toward an increasing service commitment of the Metro-Calgary hospital group to the elderly residents of rural districts, the trend was toward a slightly decreasing commitment of the Metro-Edmonton hospital group to the elderly residents of the regional districts. Analysis of ALOS revealed generally higher ALOS for the Metro-Calgary hospital group than for the Metro-Edmonton hospital group serving elderly residents of either regional or rural districts.

Of note was the finding that, the service commitment, in terms of elderly SEPS and PDAYS, of the Metro-Calgary hospital group to the elderly residents of Metro-Edmonton, as well as of the Metro-Edmonton hospital group to the elderly residents of Metro-Calgary, was relatively minimal.

The foregoing research findings regarding the CI for each of the two metropolitan hospital groups indicated an increasingly greater referral center role for acute care hospitals located in the Metro-Edmonton district than for those located in Metro-Calgary. Moreover, this role had been fulfilled with comparatively lower ALOS. These results may have been attributed to the treatment of more chronic elderly illness or higher disease complexity and, therefore, longer ALOS, in Metro-Calgary hospitals and/or to differences in discharge planning policies/practices among the hospitals located in the two metropolitan districts.

A subsequent origin-destination analysis according to the hospital perspective was performed for the Metro-Calgary and Metro-Edmonton hospital groups by comparing the respective CIs to eight district areas: (1) Metro-Calgary; (2) Surrounding Metro-Calgary; (3) Metro-Edmonton; (4) Surrounding Metro-Edmonton; (5) Grande Prairie; (6) Lethbridge; (7) Medicine Hat; and (8) Red Deer. The results of this analysis are presented in Table 20. In general, the findings revealed that the service commitment, in terms of elderly SEPS and PDAYS, of the Metro-Calgary hospital group to the elderly residents of outside district areas was: (1) firstly, to the elderly residing in rural districts in close proximity to and surrounding the Metro-Calgary district (8.4 percent SEPS and 7.7 percent PDAYS, overall); (2) secondly, to the elderly of the Lethbridge regional area; and (3) thirdly, to the elderly residents of the Red Deer regional

Table 20
Trends in CIs* for Metro-Calgary and Metro-Edmonton Hospitals to Eight District Areas

Hospital of Patient Destination	Utilization Measure	Patient Origin - District/Region: Metro-Calgary 1971	1976	1981/82	1971-81/82	Surrounding 1971	1976	Metro-Calg. 1981/82	1971-81/82	Metro-Edmonton 1971	1976	1981/82	1971-81/82	Surrounding 1971	1976	Metro-Edm. 1981/82	1971-81/82
Metro-Calgary	SEPS %	87.3	85.4	83.1	84.5	7.3	8.2	8.6	8.4	0.4	0.2	0.2	0.3	0.3	0.4	0.4	0.4
	PDAYS %	87.6	86.6	85.4	85.7	6.9	7.4	7.6	7.7	0.2	0.3	0.2	0.2	0.4	0.3	0.2	0.3
	ALOS	20.7	18.7	18.0	18.8	19.5	16.7	15.4	16.9	12.3	25.2	13.3	15.1	24.3	13.4	9.1	14.2
Metro-Edmonton	SEPS %	0.1	0.3	0.2	0.2	0.4	0.3	0.2	0.3	69.8	68.7	67.3	68.5	22.4	23.7	25.7	23.9
	PDAYS %	0.1	0.3	0.2	0.2	0.4	0.3	0.1	0.3	71.6	70.8	71.1	71.1	20.9	22.3	22.9	21.9
	ALOS	10.6	17.1	15.4	16.2	20.8	15.4	11.6	15.1	18.3	17.5	16.9	17.8	16.7	15.9	14.2	15.8

* Calculated, in terms of percentages, for elderly SEPS and PDAYS. Theoretically, the sum of all CIs over all districts for a given hospital and year is 100% (rounding off error may result in slight deviations from 100%).

Table 20 Continued

Hospital of Patient Destination	Utilization Measure	Patient Origin - District/Region: Grande Prairie 1971	1976	1981/82	1971-81/82	Lethbridge 1971	1976	1981/82	1971-81/82	Medicine Hat 1971	1976	1981/82	1971-81/82	Red Deer 1971	1976	1981/82	1971-81/82
Metro-Calgary	SEPS %	0.2	0.1	0.1	0.1	2.8	3.3	4.6	3.9	0.5	0.8	1.1	0.8	1.2	1.6	1.8	1.6
	PDAYS %	0.1	0.0	0.1	0.1	2.8	3.1	4.1	3.7	0.7	0.8	1.1	0.9	1.3	1.4	1.4	1.5
	ALOS	12.1	10.1	8.6	14.7	20.3	17.8	15.7	17.3	30.6	18.2	17.5	18.9	21.2	16.7	13.8	16.7
Metro-Edmonton	SEPS %	3.4	3.7	3.4	3.6	0.4	0.3	0.2	0.3	0.1	0.0	0.1	0.1	3.5	3.0	2.9	3.1
	PDAYS %	3.4	3.4	3.0	3.4	0.4	0.2	0.1	0.3	0.1	0.0	0.1	0.1	3.2	2.8	2.4	2.8
	ALOS	18.1	15.8	14.3	16.0	18.3	12.6	12.4	17.1	13.1	9.0	13.3	13.9	16.3	15.4	13.4	15.4

area (1.6 percent SEPS and 1.5 percent PDAYS, overall). For these three areas, the indicated trend was toward an increasing commitment, over time, by the Metro-Calgary hospital group. Of noteworthy observation was that Metro-Calgary hospitals had a minimal commitment (0.8 percent SEPS and 0.9 percent PDAYS, overall) to the elderly residing in the Medicine Hat region. Based on this observation and those of Tables 16 and 18, it appeared that some of the elderly residing in Calgary region districts which bordered on the Medicine Hat region tended to travel to Medicine Hat.

In comparison to the above findings, the service commitment of Metro-Edmonton hospitals to providing treatment to the elderly residents of outside district areas was highest to the rural districts surrounding Metro-Edmonton (23.9 percent SEPS and 21.9 percent PDAYS, overall), and considerably lower to Grande Prairie (3.6 percent SEPS and 3.4 percent PDAYS, overall) and to Red Deer (3.1 percent SEPS and 2.8 percent PDAYS, overall). Of note was the fact that the CI of the Metro-Edmonton hospital group was higher than that of Metro-Calgary hospital group to the elderly residents of the Red Deer regional area.

Comparison of ALOS for the elderly residents of the two rural areas surrounding the metropolitan districts revealed a higher ALOS in Metro-Calgary hospitals for the elderly residents of rural districts surrounding Metro-Calgary, than in Metro-Edmonton hospitals for the elderly residents of the

rural districts surrounding Metro-Edmonton.

4.5.3. Summary of Findings

Patient origin-destination analysis of hospital care-seeking patterns by the elderly in Alberta revealed the following:

1) Hospital care-seeking behavior by the elderly demonstrated to be more of a local phenomenon, in that most elderly patients remained within their own area or region of residence to receive hospital care. Thus, the concept of distance minimization to care facility when seeking health services was considered to be applicable to the elderly population.

2) When seeking care outside the area of residence, rural elderly residents tended to bypass regional hospitals, thereby seeking care in metropolitan hospitals. Physician referral patterns and/or the geographic network of major transportation routes may have accounted for this tendency. Over the years, the trend had been to increasingly seek care in metropolitan hospitals for the elderly residents of rural and regional areas.

3) By way of the provider (hospital) analytic perspective, the findings revealed that the higher the level of urbanization, and thus the higher the level of care available, within an area, the lower the service commitment of the hospitals to the elderly residing

within the area. Moreover, each of the six provincial regions demonstrated a primary and substantial service commitment to the elderly residents within their region.

4) A trend toward an increasing service commitment to the rural elderly by metropolitan and regional hospitals was evident.

5) Metro-Edmonton hospitals had a far greater commitment to the elderly residents of surrounding Metro-Edmonton districts than Metro-Calgary had to surrounding Metro-Calgary districts; thereby, denoting a greater referral centre role for Metro-Edmonton hospitals for the treatment of elderly patients.

The possible reasons for these observed findings were discussed.

4.6 Summary of Results

During the study period, 1971 to 1981/82, Alberta was considered to be a relatively "young" Canadian province, with the elderly segment of the population accounting for 7.3, 7.5 and 7.3 percent of the total provincial population in 1971, 1976 and 1981, respectively. Nevertheless, between 1971 and 1981, the elderly segment of the population increased by 37.2 percent, with this increase being attributed primarily to an increase in the 65-69 year age group and to elderly females. In relation to these demographic trends, the structural components of Alberta's

hospital system, including hospitals and hospital districts, had remained relatively stable. However, whereas the actual number of acute care beds had increased over the time, the per capita bed supply had decreased by 27 percent. Similarly, the supply of nursing home beds per 1000 elderly persons had declined. The supply of auxiliary hospital beds and long-term beds in general hospitals had remained relatively unchanged.

In relation to the foregoing trends in provincial demographic and health delivery system characteristics, the examination of trends in hospital utilization rates and patterns by the elderly population produced the following results:

1) Provincial hospital utilization rates and trends indicated an increasing "burden" on acute care hospitals by the elderly population over the years. In this regard, the total number of elderly SEPS and PDAYS, as well as the proportion of elderly SEPS and PDAYS to those of the total population, had increased. Moreover, the elderly demonstrated substantially higher SEPRATEs, PDAYRATEs and ALOS than the nonelderly. Although all hospital utilization rates had decreased from 1971 to 1981/82, for the elderly, nonelderly and total population, the decrease was significantly higher for the nonelderly than the elderly segment of the population. Within the elderly group, all hospital utilization rates increased with increasing age group,

with the 75 year and over age group maintaining the highest utilization rates, with relative stability of rates over time.

2) Analysis of district variation in utilization rates by the elderly revealed:

   a) wide variations in hospital utilization rates among districts;

   b) whereas high and very high rates spanned a broad geographic area of the province, this encompassed less than 28 percent of the total elderly population; and

   c) districts located in the northeastern, northwestern and east-central parts of the province exhibited very high PDAYRATEs. Districts with moderate rates bordered on the north-to-south Highway 2 corridor.

3) The examination of regional variation in hospital utilization rates by the elderly revealed that elderly SEPRATEs and PDAYRATEs were below and ALOS was above the provincial rate for both Metro-Calgary and Metro-Edmonton. Elderly SEPRATEs and PDAYRATEs were higher for the Metro-Edmonton district than for Metro-Calgary, however, Metro-Calgary demonstrated a higher ALOS in comparison. Notwithstanding, the trend toward decreasing utilization rates for both districts over time, the decrease in elderly SEPRATEs and PDAYRATEs was greater for Metro-Edmonton, but the

decrease in ALOS was more substantial for Metro-Calgary. In general, the differences between the two districts decreased over time. Differences in acute care bed supply or selective admissions were postulated to have accounted, to some degree, for the observed findings.

4) Analysis of utilization rates by metropolitan, regional and rural areas generally indicated that, with increasing level of urbanization and increasing level of care available within an area, the elderly SEPRATE and PDAYRATE decreased and ALOS increased. In this regard, metropolitan and regional areas exhibited elderly SEPRATEs and PDAYRATEs which were below the provincial rate, whereas those of rural areas were above the provincial rate. In contrast, ALOS was above the provincial rate only in metropolitan areas. The trend had been toward gradually decreasing PDAYRATEs for all areas. Of note was the fact that, whereas ALOS for the elderly had decreased over time in metropolitan and regional areas, it had remained relatively stable in rural areas and had exceeded that of regional areas since 1977.

5) Hospital utilization rates by the elderly, according to the six geographic regions in the province, indicated that the rates were relatively high for the Grande Prairie region and low for the Calgary region. High SEPRATEs and PDAYRATEs and low ALOS suggested many

repeated admissions and/or relaxed admissions criteria for the Grande Prairie region. In contrast, low SEPRATEs and PDAYRATEs and high ALOS implied more selective admissions for the Calgary region.

6) In general, the patient origin-destination analyses according to the community (district) perspective indicated that most elderly patients tended to seek hospital care in their area/region of residence. Nevertheless, when seeking care outside of rural areas, rural residents tended to bypass regional areas and travel to metropolitan areas.

7) Patient origin-destination analyses according to the provider (hospital) perspective revealed that the lower the level of care available within a particular group of hospitals, the higher the service commitment of that hospital group to the elderly residents living within the area. Moreover, the higher the level of care available within a hospital, the higher the ALOS. Metro-Calgary hospitals demonstrated a higher commitment to the elderly residents living within the Metro-Calgary district than did Metro-Edmonton hospitals to elderly Metro-Edmonton residents. As such, Metro-Edmonton hospitals had a higher service commitment to the elderly residing in the rural districts surrounding Metro-Edmonton. These findings suggested a greater referral centre role for Metro-Edmonton hospitals.-

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The main purpose of this study, the research strategies undertaken to achieve the study objectives, and the major findings and ensuing conclusions are summarized herein. In addition, recommendations for further research and analysis are offered.

5.1 Summary of the Study

In view of the demographic changes in the age structure of the population, in particular the unprecedented growth in the elderly segment of the population, and increasing health care costs coupled with shrinking health resources, the utilization of acute care hospitals by the elderly had emerged as a significant concern to health care administrators, planners and policy makers. Moreover, issues related to heavy consumption, long-stay hospitalization, and the incompatibility between the cure-oriented hospital sector and the care needs of the elderly had presented a challenge to health care planning and policy development endeavors at the hospital system level. In view of the foregoing concerns, this study was undertaken to assess the volume and patterns of hospital utilization by the elderly within the Alberta hospital system. As such, the study objectives were aimed at: (1) comparing the relative consumption and level of hospital utilization between the elderly and nonelderly,

and examining trends over time; (2) analyzing geographic variations in the rates of hospital utilization by the elderly; and (3) examining hospital care-seeking movement patterns by the elderly, throughout the province.

A selective review of the literature provided the basis for the development of a conceptual framework which would place this study into proper research perspective in relation to health services utilization, in general, and acute care hospital utilization by the elderly, in particular. In general, the literature suggested that health services utilization is a function of the dynamic interaction of need, demand and supply factors with individual, health delivery system and societal determinants of utilization. With respect to the use of health services by the elderly, the writings in the literature were mainly descriptive in nature and tended to focus on issues related to long-stay hospitalization and bed blocking; however, the general tenet was that factors which influence health services utilization by the general population also affect utilization by the elderly population. A review of patient origin-destination studies demonstrated the utility of origin-destination analysis for quantifying hospital care-seeking movement patterns, thereby rendering it suitable for the purposes of this study.

Given the scope of the research objectives and the nature of the published research developments, the general research strategy which was employed was of an exploratory

and descriptive nature. Moreover, trends in hospital utilization rates were examined over time, by way of retrospective and longitudinal data, and a comparative, population-based research strategy facilitated the calculation of per capita utilization rates and the relative comparison of the elderly's use of hospitals to that of the nonelderly.

The objectives of this study translated into four data analytic strategies. Firstly, an overall provincial analysis comparing the rates and trends in hospital utilization between the elderly and the nonelderly segments of the population was conducted for the study period 1971 to 1981/82. Secondly, interdistrict variation in hospital utilization rates by the elderly were examined by way of a hospital district analysis. Thirdly, districts were clustered to form larger areas and regions, and geographic variations in utilization rates were thus investigated. Finally, the elderly's hospital care-seeking movement patterns throughout the hospital system in Alberta were studied by way of patient origin-destination analyses.

5.2 Major Findings

The major findings of this descriptive, longitudinal and comparative study of the utilization of acute care hospitals by the elderly in Alberta included the following:

1) From 1971 to 1981/82, a trend towards declining per capita hospital utilization rates was evident for the

total population. In this regard, hospital separation rates decreased by 22.4 percent, patient-day rates decreased by 31.6 percent, and average length of stay dropped by 12.8 percent, from 8.6 to 7.5 patient-days per separation, for the total population.

2) During the study period, overall utilization rates for the nonelderly segment of the population decreased substantially. Nonelderly separation rates decreased from 212 to 159 separations per 1000 nonelderly person-years (25 percent decrease), and patient-day rates decreased from 1.6 to 1.0 patient-days per nonelderly person-year. Average length of stay had dropped 17.8 percent, from 7.3 to 6.0 patient-days per separation.

3) Hospital utilization rates for the elderly population also exhibited an overall trend toward declining rates. Although, from 1971 to 1981/82, the actual number of elderly separations and patient-days increased by 29.2 and 20.8 percent, respectively, the relative proportion of elderly separations and patient-days to the total population had increased. This proportion had increased from 13.6 to 16.5 percent, in terms of separations, and from 25.9 to 33.3 percent, in terms of patient-days, from 1971 to 1981/82. With respect to per capita rates of utilization, elderly separation rates and patient-day rates decreased by 5.7 and 8.9 percent, respectively. Average length of stay dropped from 16.3

to 15.2 patient-days per elderly separation.

4) Within the elderly group, all hospital utilization measures tended to increase with increasing age group. Nevertheless, over time, separation rates, patient-day rates and average length of stay for the 65-69 and 70-74 year age groups demonstrated a declining trend. In contrast, all measures tended to remain generally stable over time for the 75 year and over age group.

5) Whereas, for all years combined, the overall elderly average separation rate was 422 separations per 1000 elderly person-years, the patient-day rate was 6.5 patient-days per elderly person-year, and the average length of stay was 15.5 patient-days per separation, a high degree of variability in elderly utilization rates occurred among the districts. Districts with high and very high utilization rates represented a broad geographic area, however, accounted for less than 28 percent of the total elderly service population.

6) Districts with high and very high elderly patient-day rates were located in the northeastern, northwestern and east-central parts of the province. Those with moderate levels primarily bordered on the north-to-south Highway 2 corridor.

7) Bentley, Cereal, Empress and Oyen consistently demonstrated high and very high hospital utilization rates by the elderly.

8) For both Metro-Calgary and Metro-Edmonton, elderly

separation rates and patient-day rates were below the provincial rate, however, average length of stay was above the provincial rate. Nevertheless, separation rates and patient-day rates were higher for Metro-Edmonton than for Metro-Calgary, but average length of stay was higher for the Metro-Calgary district. A trend toward declining rates was noted for both districts.

9) Metropolitan areas demonstrated the highest average length of stay, but low separation and patient-day rates. Regional areas had intermediate separation rates, low patient-day rates (similar to metropolitan areas), and low average length of stay (similar to rural areas). As such, rural areas exhibited the highest separation and patient-day rates, but low average length of stay. Of note was the finding that elderly average length of stay in rural areas had exceeded that of regional areas since 1977.

10) Among the six geographic regions, Grande Prairie exhibited the highest rates of hospital utilization by the elderly, in terms of separation and patient-day rates, but the lowest average length of stay. In contrast, the Calgary region had the lowest separation rates, patient-day rates which were similar to the Medicine Hat region, and the highest overall average length of stay.

11) With respect to hospital care-seeking patterns by the

elderly, the following were noted:

a) most elderly patients received hospital care within their area of residence;

b) rural elderly patients tended to bypass regional hospitals, when seeking care outside their area of residence, and travelled primarily to metropolitan hospitals; and

c) for all elderly residents of regions other than Calgary or Edmonton, any notable travel patterns were to the nearest Edmonton or Calgary region.

12) The service commitment of hospitals to the elderly residents located within their area decreased as one moved from rural to regional to metropolitan areas. The outside service commitment of both metropolitan and regional hospitals was to rural residents, with this trend increasing over time.

13) The commitment of Metro-Edmonton hospitals to the elderly residents of the rural districts surrounding Metro-Edmonton was substantially greater than Metro-Calgary hospitals' commitment to the elderly residents of the rural districts surrounding Metro-Calgary.

5.3 Conclusions

Based on the findings of this study, and in recognition of the study scope and limitations, the following conclusions may be made:

1) In view of the trend toward increasing number of separations, decreasing number of patient-days, and decreasing average length of stay, it appears that hospital throughput has increased substantially over time, as far as the nonelderly segment of the population is concerned. For the elderly, and especially the 75 year and over age group, this throughput appears to be much lower.

2) Following from the first conclusion, it would appear that the general declining trends in total population utilization rates have been primarily at the "expense" of the nonelderly population, and that the elderly may be "replacing" the nonelderly in hospitals; thereby, the elderly "burden" on acute care hospitals may be increasing. Should the trend continue, this would create a major problem in the hospital sector. The findings of this study did not suggest that these trends would otherwise reverse.

3) It appears that, despite the trend toward gradually declining hospital utilization rates by the elderly, the actual and relative consumption of acute care resources by the elderly is increasing significantly.

4) Given the declining average length of stay for the elderly over the years, it would appear that, to some extent, geriatrics may have adopted an acute care model of increasing patient throughput despite large differences in average length of stay in the acute

medical and geriatric specialties.

5) It appears that high per capita rates of hospital utilization by the elderly is a rural phenomenon, and that low utilization rates are associated with urbanized areas having a full spectrum of primary, secondary and tertiary levels of care available, as well as other non-acute care services, such as, home care and long-term care.

6) The concept of distance minimization to care facility appears to be applicable to hospital care-seeking patterns of the elderly.

7) There was some indication to suggest that acute care beds in some small rural districts in the province may have been used in a long-term care capacity.

5.4 Recommendations

Based on the major findings and conclusions of this study, the following recommendations are offered:

1) Any attempt at reducing a problem of high and very high hospital utilization rates by the elderly in Alberta should adopt a province-wide planning approach which would span a broad geographic area. However, given the relatively small elderly service population at which any province-wide resolution would aim, the cost-effectiveness of any approach would need to be examined.

2) Policies aimed at curtailing acute care hospital costs

should take the elderly segment of the population into consideration. Since marked decreases in hospital utilization by the elderly seem unlikely, and as such utilization seems to be increasing for this group, hospital cost-cutting measures may be at the expense of the nonelderly segment of the population.

3) This study was limited in scope partly due to resource and time constraints. Further refinement, extension and/or modification of this study should consider:
   a) an indepth and comprehensive investigation of district and regional utilization rates by elderly and nonelderly age/sex categories;
   b) a trend analysis study of the relationship between hospital acute care bed supply, long-term care bed supply, and acute care hospital utilization rates by the elderly;
   c) the application of regression analysis to assess the impact of geographic location of residence and time (independent variables) on the elderly's hospital utilization rate (dependent variable).
4) Further research may be undertaken in the following areas:
   a) a comprehensive analysis of hospital utilization rates by the elderly in rural areas;
   b) an examination of rural-to-urban migration patterns by the elderly over time, in order to assess the magnitude of this movement and its

potential influence on acute care hospital utilization rates;

c) an investigation of the medical and/or social reasons for the elderly's long-stay in hospitals and an evaluation of the related care need requirements;

d) an investigation of hospital utilization by the elderly by levels of care, employing the concept of diagnostic related groups (DRGs).

REFERENCES

Aday, L.A. Economic and noneconomic barriers to the use of needed medical services. Medical Care, 1975, 13(16), 447-456.

Aday, L.A., & Andersen, R. Insurance coverage and access: implications for health policy. Health Services Research, 1978, 13(4), 369-377.

Aday, l.A., & Eichorn, R. The Utilization of Health Services: Indices and Correlates. Washington: National Center for Health Services Research and Development, 1972.

Alberta Hospital Services Commission. Annual Report 1971.

Alberta Hospital Services Commission. Annual Report 1972.

Alberta Hospital Services Commission. Annual Report 1974.

Alberta Hospital Services Commission. Annual Report for the Year Ended December 31, 1975.

Alberta Hospital Services Commission. Annual Report for the Year Ended March 31, 1977.

Alberta Hospital Services Commission. Annual Report for the Nine Month Period Ended December 31, 1977.

Alberta Hospitals and Medical Care. Annual Report 1978/79.

Alberta Hospitals and Medical Care. Annual Report 1979/80.

Alberta Hospitals and Medical Care. Annual Report 1980/81.

Alberta Hospitals and Medical Care. Annual Report 1981/82.

American Hospital Association. Administrators' Guide Issue, Hospitals, 1955, 29(August), Part II, (opposite p. 5).

Andersen, R. A Behavioral Model of Families' Use of Health Services. Chicago: Center for Health Administration Studies, 1968.

Andersen, R., & Anderson, O. Trends in the use of health services. In H.E. Freeman, S. Levine, & L.G. Reeder (eds.), Handbook of Medical Sociology. 3rd edition, New Jersey: Prentice-Hall Inc., 1979, pp. 371-391.

Andersen, R., & Hull, J.T. Hospital utilization and cost trends in Canada and the United States. Health Services

Research, 1969, 4(3), 198-222.

Andersen, R., & Newman, J.F. Societal and individual determinants of medical care utilization in the United States. The Milbank Memorial Fund Quarterly, 1973, 51 (1), 95-124.

Anderson, J.G. Causal model of health service systems. Health Services Research, 1972, 7(1), 23-47.

Anderson, J.G. Demographic factors affecting health services utilization: a causal model. Medical Care, 1973a, 11(2), 104-120.

Anderson, J.G. Health services utilization: framework and review. Health Services Research, 1973b, 8(3), 184-199.

Anderson, O.W. The utilization of health services. In H.E. Freeman, S. Levine, & L.G. Reeder. Handbook of Medical Sociology. New Jersey: Prentice-Hall Inc., 1963, pp. 349-367.

Anderson, R., & Aday, L.A. Access to medical care in the U.S.: realized and potential. Medical Care, 1978, 16(7), 533-546.

Auerbach, L., & Gerber, A. Implications of the Changing Age Structure of the Canadian Population. Ottawa: Minister of Supply and Services Canada, 1976.

Badgely, R.S., Hetherington, R.W., Matthews, V.L., & Schulte, M. The impact of medicare in Wheatville, Saskatchewan 1965-1969. Canadian Journal of Public Health, 1967, 58(3), 101-108.

Bashshur, R.L., Shannon, G., & Metzner, C. Some ecological differentials in the use of medical services. Health Services Research, 1971, 6(1), 61-75.

Bay, K.S., & Nestman, L.J. A hospital service population model and its applications. International Journal of Health Services, 1980, 10(4), 677-695.

Bay, K.S., & Nestman, L.J. The use of bed distribution and service population indexes for hospital bed allocation. Health Services Research, 1984, 19(2), 141-160.

Bennett, I. Technology as a shaping force. Daedalus, 1977, 106, 125-131.

Berg, R.L., Browning, F.E., Hill, J.G., & Wenkert, W. Assessing the health care needs of the aged. Health Services Research, 1970, 5(1), 36-59.

Bice, T.W., & White, K.L. Factors related to the use of health services: an international comparative study. Medical Care, 1969, 7(2), 124-133.

Bice, T.W., & White, K.L. Cross-national comparative research on the utilization of medical services. Medical Care, 1971, 9(3), 253-271.

Bouchier, I.A.D., & Williamson, J. The elderly patient in the acute hospital sector. Health Bulletin(Edinb.), 1982, 40(4), 179-182.

Boulding, K.E. The concept of need for health services. The Milbank Memorial Fund Quarterly, 1966, 44(Suppl.), 202-221.

Branch, L., Jette, A., Evashwick, C., Polansky, M., Rowe, G., & Diehr, P. Toward understanding elders' health service utilization. Journal of Community Health, 1981, 7(2), 80-92.

Brewer, W.R., & Freedman, M.A. Causes and implications of variation in hospital utilization. Journal of Public Health Policy, 1982, 3(4), 445-454.

Burley, L.E., Currie, C.T., Smith, R.G., & Williamson, J. Contributions from geriatric medicine within acute medical wards. British Medical Journal, 1979, 2(6182), 90-92.

Canada Health Act (White Paper - Draft 2). Ottawa: Department of National Health and Welfare, 1982.

Chiswick, B.R. Hospital utilization: an analysis of SMSA differences in occupancy rates, admission rates, and bed rates. Explorations in Economic Research, 1976, 3, 326-378.

Churchman, C.W. The Systems Approach. New York: Dell Publishing Co., 1968.

Ciocco, A., & Altenderfer, M.E. Birth statistics as an index of interdependence of counties with regard to medical services. Public Health Reports, 1945, 60(24), 973-985.

Cooper, M. Economics of need: the experience of the British health service. In M. Perlman (ed.), The Economics of Health and Medical Care. London: Macmillan Press, 1974, pp. 89-107.

Currie, C.T., Smith, R.G., & Williamson, J. Medical and nursing needs of elderly patients admitted to acute medical beds. Age and Ageing, 1979, 8(3), 149-151.

De Miguel, J.M. A framework for the study of national health systems. Inquiry, 1975, 12(12), 10-12.

Densen, P.M., Jones, E.W., Balaruth, F., & Shapiro, S. Prepaid medical care and hospital utilization in a dual choice situation. American Journal of Public Health, 1960, 50(11), 1710-1726.

Durbin, R.L., & Antelman, G. A study of the effects of selected variables on hospital utilization. Hospital Management, 1964, 98(August), 57-60.

Engelmann, M., & Stevenson, C. Profile of Older Persons in Alberta: Demographic Characteristics and Service Utilization. Edmonton, Alberta: Research and Planning Division, Alberta Social Services and Community Health, February, 1980.

Enterline, P.E., Salter, V., McDonald, A., & McDonald J.C. The distribution of medical services before and after "free" medical care - the Quebec experience. New England Journal of Medicine, 1973, 289(22), 1174-1178.

Estes, C.L., Gerard, L., & Clarke, A. Women and the economics of aging. International Journal of Health Services, 1984, 14(1), 55-68.

Farrow, S.C., Rablen, M.R., & Silver, C.P. Geriatric admissions in east London 1962-72. Age and Ageing, 1976, 5(1), 49-55.

Feldstein, P.J. Research on the demand for health services. The Milbank Memorial Fund Quarterly, 1966, 44(Suppl.), 128-162.

Field, M.G. The concept of the "health system" at the macrosociological level. Social Science and Medicine, 1973, 7(10), 763-785.

Fielder, J.L. A review of the literature on access and utilization of medical care with special emphasis on rural primary care. Social Science and Medicine, 1981, 15C(3), 129-142.

Fuchs, V.R. The growing demand for medical care. New England Journal of Medicine, 1968, 279(4), 190-195.

Gaag, van der, J., Rutten, F.F.H., & van Praag, B.M.S. Determinants of hospital utilization in the Netherlands. Health Services Research, 1975, 10(3), 264-277.

Gertson, R., Klauber, M.R., Rindflesh, M., Kan, R.C., &

Gray, R.A. A re-examination of Suchman's views on social factors in health care utilization. Journal of Health and Social Behavior , 1975, 16(2), 226-237.

Gibson, G. Explanatory models and strategies for social change in health care behavior. Social Science and Medicine, 1972, 6(5), 635-639.

Glass, R.I., Mulvihill, M.N., Smith, H., Peto, R., Bucheister, D., & Stoll, B.J. The 4 score: an index for predicting a patient's non-medical hospital days. American Journal of Public Health, 1977, 67(8), 751-755.

Gordon, P., Weldon, K., & MacLean, L. Trends in hospital utilization in Nova Scotia 1967-1972. Nova Scotia Medical Bulletin, 1974, 53(April), 47-54.

Greenhill, S., & Haythorne, D. Alberta Health Care Study: Health Care Utilization Patterns of Albertans 1968 and 1970. Edmonton, Alberta: Department of Community Medicine, The University of Alberta, 1972.

Griffith, J.R. Quantitative Techniques for Hospital Planning and Control. Toronto: Lexington Books, 1972.

Griffith, J.R. Measuring Hospital Performance. Chicago: Blue Cross Association, 1978.

Griffith, J.R., Restuccia, J.D., Tedeschi, P.J., Wilson, P.A., & Zuckerman, H.S. Measuring community hospital services in Michigan. Health Services Research, 1981, 16(2), 135-160.

Griffiths, R.A., & Cosin, L.Z. The floating-bed. Lancet, 1976, 1(March 27), 684-685.

Guzick, D.S. The demand for general practioner and internist services. Health Services Research, 1978, 13(4), 351-368.

Halevi, H.S., & Benbassat, J. Trends in hospitalization rates of the elderly for acute and chronic diseases, Israel, 1954-72, Israel Journal of Medical Sciences, 1982, 18(5), 567-573.

Hall, D., & Bytheway, B. The blocked bed. Definition of a problem. Social Science and Medicine, 1982, 16(22), 1985-1991.

Harris, D.M. An elaboration of the relationship between general hospital bed supply and general hospital utilization. Journal of Health and Social Behavior, 1975a, 16(12), 163-172.

Harris, D.M. Effect of population and health care environment on hospital utilization. Health Services Research, 1975b, 10(3), 229-243.

Haug, M.R. Age and medical care utilization patterns. Journal of Gerontology, 1981, 36(1), 103-111.

Hazell, K. Social and Medical Problems of the Elderly. 4th edition. London: Hutchinson & Co. Ltd., 1976.

Health and Welfare Canada. Hospitals and the Elderly: Present and Future Trends. Ottawa, 1975.

Hershey, J.C., Luft, H.S., & Gianaris, J.M. Making sense out of utilization data. Medical Care, 1975, 13(10), 838-854.

Hobbs, M.S.T. The demography of the elderly population in western Australia in relation to development of health services. In W.W. Holland, J. Ipsen, & J. Kostrzewski (eds.), Measurement of Levels of Health. Copenhagen: World Health Organization, 1979, pp. 281-286.

Hodkinson, H.M., & Hodkinson, I. Death and discharge from a geriatric department. Age and Ageing, 1980, 9(4), 220-228.

Hodkinson, I., & Hodkinson, H.M. The long-stay patient. Gerontology, 1981, 27(3), 167,172.

Jeffers, J.R., Bognanno, M.F., & Bartlett, J.C. On the demand versus need for medical services and the concept of "shortage". American Journal of Public Health, 1971, 61(1), 46-63.

Kalimo, E. Health service needs. In W.W. Holland, J. Ipsen, & J. Kostrzewski (eds.), Measurement of Levels of Health. Copenhagen: World Health Organization, 1979a, pp. 64-72.

Kalimo, E. A method for estimating the need for medical care. In W.W. Holland, J. Ipsen, & J. Kostrzewski (eds.), Measurement of Levels of Health. Copenhagen: World Health Organization, 1979b, pp. 313-319.

Kekki, P. Analysis of relationships between the availability of resources and the use of health services in Finland. Medical Care, 1980, 18(12), 1228-1240.

Kelly, T.F., & Schieber, G.J. Factors Affecting Medical Services Utilization: A Behavioral Approach. Washington D.C.: The Urban Institute, 1972.

Korcok, M. Exploring health care alternatives for the elderly. Canadian Medical Association Journal, 1981, 124(June 1), 1524-1525.

Kovar, M.G. Health of the elderly and the use of health services. Public Health Reports, 1977, 92(1), 9-19.

Krout, J.A. Correlates of service utilization among the rural elderly. The Gerontologist, 1983, 23(5), 500-504.

Lalonde, M. A New Perspective on the Health of Canadians: A Working Document. Ottawa: Information Canada, April 1974.

Langlie, J.K. Social Networks, health beliefs, and preventive health behavior. Journal of Health and Social Behavior, 1977, 18(3), 244-260.

Lawrence, M. Geriatric cuckoo. World Medicine, 1979, 25(August), 19-20.

Lembcke, P.A. Measuring the quality of medical care through vital statistics based on hospital service areas: 1. Comparative study of appendectomy rates. American Journal of Public Health, 1952, 42(3), 276-286.

Lipman, A., & Sterne, R. Aging in the United States: ascription of a terminal sick role. Sociology and Social Research, 1969, 53, 194-203.

Long, M.J. The role of consumer location in the demand for inpatient care. Inquiry, 1981, 18(3), 266-273.

Macdonald, P.J. Utilization of Surgical Services in Alberta. Unpublished Master's Thesis. Department of Health Services Administration and Community Medicine, University of Alberta, 1983.

MacMahon, B., & Puch, T.F. Epidemiology: Principles and Methods. Boston: Little, Brown, 1970.

MacStravic, R.E. Determining Health Needs. Ann Arbor, Michigan: Health Administration Press, 1978.

Markson, E.W., Steel, K., & Kane, K. Administratively necessary days: more than an administrative problem. The Gerontologist, 1983, 23(5), 486-492.

Marrinson, R. Hospital service areas: time replaces space. Hospitals, 1964, 38(2), 52-54.

Mauksch, H.O. Ideology, interaction, and patient care in hospitals. Social Science and Medicine, 1973, 7, 817-830.

Mausner, J.S., & Bahn, A.K. Epidemiology: An Introductory Text. Philadelphia: W.B. Saunders Company, 1974.

May, L.A., & Shortell, S.M. Factors associated with the utilization of health services. In S.J. Williams & P.R. Torrens (eds.), Introduction to Health Services. New York: John Wiley & Sons, Inc., 1980, pp. 48-90.

McArdle, C., Wylie, J.C., & Alexander, W.D. Geriatric patients in an acute medical ward. British Medical Journal, 1975, 4(December 6), 568-569.

McKinlay, J.B. Some approaches and problems in the study of the use of services - an overview. Journal of Health and Social Behavior, 1972, 13(2), 115-152.

Meade, J. A mathematical model for deriving hospital service areas. International Journal of Health Services, 1974, 4(2), 353-364.

Mechanic, D. The conceppt of illness behavior. Journal of Chronic Diseases, 1962, 15(February), 189-194.

Minkler, M. Blaming the aged victim: the politics of scapegoating in times of fiscal conservatism. International Journal of Health Services, 1983, 13(1), 155-168.

Morgan, D.A. Assessment and placement service: a key to successful bed utilization. Dimensions, 1974, 51(7), 46-49.

Morrill, R.L., & Earickson, R. Variations in the character and use of Chicago area hospitals. Health Services Research, 1968, 3(3), 224-238.

Mossey, J.M., Havens, B., Roos, N.P., & Shapiro, E. The Manitoba longitudinal study on aging: description and methods. The Gerontologist, 1981, 21(5), 551-558.

Murphy, F.W. Blocked beds. British Medical Journal, 1977, 1(May 28), 1395-1396.

Nagi, S.Z., & Marsh, J. Disability, health status, and utilization of health services. International Journal of Health Services, 1980, 10(4), 657-676.

O'Brien, T.D., Joshi, D.M., & Warren, E.W. No apology for geriatrics. British Medical Journal, 1973, 4(November 3), 277-280.

Ohmura, J. Analysis of factors affecting the need and demand

for medical care. Social Science and Medicine, 1978, 12(6A), 485-496.

Paget, A.G. Acute care hospitals: their role in long-term care. Dimensions, 1983, 60(11), 28-29.

Pain, D.W., & Wilson, L.L. The determination of acute care bed requirements for provincial acute care hospital regions. In N.T.J. Bailey, M. Thompson (eds.), Systems Aspects of Health Planning. Amsterdam: North-Holland Publishing Companying, 1975, pp. 63-76.

Poland, E., & Lembcke, P.A. Delineation of Hospital Service Districts - Methodolgy and Statistical Appendices. Kansas City: Community Studies, Inc., 1962.

Portnoi, V.A. A health care system for the elderly. New England Journal of Medicine, 1979, 300(24), 1387-1390.

Raasok, S.M. Nursing Home Bed Utilization in Alberta: A Patient Origin-Destination Study. Unpublished Master's Thesis. Division of Health Services Administration, University of Alberta, 1979.

Rainey, C.G.E., Russell, W.F., & Silver, C.P. Long stay patients in the London Borough of Tower Hamlets. Age and Ageing, 1975, 4(4), 247-254.

Ro, K. Patient characteristics, hospital characteristics, and hospital use. Medical Care, 1969, 7(4), 295-312.

Robertson, D., Griffiths, R.A., & Cozin, L.Z. A community-based continuing care program for the elderly disabled: an evaluation of planned intermittent hospital readmission. Journal of Gerontology, 1977, 32(3), 334-339.

Rochefort, D.A., Williams, D.C., Kelley, B.C., Gute, D.M., & Jackson, J.K. Rhode Island's aging population and the use of medical care, 1980-2020. Rhode Island Medical Journal, 1983, 66(2), 74-80.

Roemer, M.I. Bed supply and hospital utilization: a natural experiment. Hospitals, 1961, 35(November), 36-42.

Rogatz, P. Excessive hospital use can be cut back. Hospitals, 1974, 48(15), 51-56.

Roghmann, K.J., Hengst, A., & Zastowny, T.R. Satisfaction with medical care - its measurement and relation to utilization. Medical Care, 1979, 17(5), 461-477.

Romeril, C. Utilization of Acute Care Hospital Pediatric Services in Alberta. Unpublished Master's Thesis.

Department of Health Services Administration and Community Medicine, 1984.

Roos, N.P., & Shapiro, E. The Manitoba longitudinal study on aging: preliminary findings on health care utilization. Medical Care, 1981, 19(6), 644-657.

Roos, N.P., Shapiro, E., & Roos, L.L. Aging and the demand for health services: which aged and whose demand. The Gerontologist, 1984, 24(1), 31-36.

Rosenberg, G.M. Future trends in health care for the elderly. Dimensions, 1983, 60(11), 15-17.

Rosenfeld, L.S., Goldmann, F., & Kaprio, L.A. Reasons for prolonged hospital stay: a study of need for hospital care. Journal of Chronic Diseases, 1957, 6(2), 141-152.

Rosenstock, I.M. Why people use health services. Milbank Memorial Fund Quarterly, 1966, 44(Suppl.), 94-127.

Rubin, S.G., & Davies, G.H. Bed blocking by elderly patients in general hospital wards. Age and Aging, 1975, 4(3), 142-147.

Russell, L.B. The diffusion of new hospital technologies in the United States. International Journal of Health Services, 1976, 6(4), 1976.

Russell, L.B. An aging population and the use of medical care. Medical Care, 1981, 19(6), 633-643.

Ruth, S., & Rudin, S.E. Geriatrics and the health care system. Hospital Administration in Canada, 1977, April, 35-40.

Salter, J.C. In-depth prognosis avoids bed blocking. Dimensions, 1982, 59(11), 22-23.

Scanlon, W.J. Nursing home utilization patterns: implications for policy. Journal of Health Politics, Policy and Law, 1980, 4(4), 619-641.

Schwartz, J.A. Data show how elderly affect hospital use. Hospitals, 1982, 56(13), 53-55.

Schwenger, C.W. Health care for aging Canadians. Canadian Welfare, 1977, 52(6), 9-12.

Science Council of Canada. Population, Technology and Resources (Report No. 25). Ottawa: Minister of Supply and Services Canada, July 1976.

Shanas, E. Health status of older people: cross-national

implications. American Journal of Public Health, 1974, 64(3), 261-264.

Shanas, E., Townsend, P., Wedderburn, D., Henning, F., Milhoj, P., & Stehouwer, J. Old People in Three Industrial Societies. New York: Atherton Press, 1968.

Shannon, G.W., Bashshur, R.L., & Metzner, C.A. The concept of distance as a factor in accessibility and utilization of health care. Medical Care Review, 1969, 26(2), 143-161.

Shapiro, E. Impending death and the use of hospitals by the elderly. Journal of the American Geriatrics Society, 1983, 31(6), 348-351.

Shapiro, E., & Roos, L.L. Using health care: rural/urban differences among Manitoba elderly. The Gerontologist, 1984, 24(3), 270-274.

Shapiro, E., & Roos, N.P. The geriatric long stay hospital patient: a Canadian case study. Journal of Health Politics, Policy and Law, 1981, 6(1), 49-61.

Shapiro, E., Roos, N.P., & Kavanagh, S. Long term patients in acute care beds: is there a cure? Gerontologist, 1980, 20(3), 342-349.

Sharp, L.J., & McCarthy, W.T. Patient origin study. Northwest Medicine, 1971, 70(2), 838-841.

Shaughnessy, P.W. Methodological issues in per capita measurement in health care. Health Services Research, 1982, 17(1), 61-81.

Shepard, R.J., Corey, P., Renzland, P., & Cox, M. The impact of changes in fitness and lifestyle upon health care utilization. Journal of Public Health, 1983, 74(1), 51-54.

Sigmond, R.M. Commentaries on "Measuring community hospital services in Michigan." Health Services Research, 1981, 16(2), 161-173.

Shortell, S.M., Richardson, W.C., Loberfo, J.P., Diehr, B., Green, K., & Weaver, B. The relationship among dimensions of health services in two provider systems: a causal model approach. Journal of Health and Social Behavior, 1977, 18(2), 139-159.

Skelton, D. The future of health care for the elderly. Journal of the American Geriatrics Society, 1977, 25, 39-46.

Smith, R.G., & Lowther, C.P. Blocked beds. Health Bulletin (Edinb.), 1975, 33(3), 112-113.

SPSS Inc. SPSSX User's Guide. Chicago: McGraw-Hill Book Company, 1983.

Statistics Canada. Canada's Elderly. Ottawa: Minister of Supply and Services Canada, March 1979.

Stone, L.O. & Fletcher, S. A Profile of Canada's Older Population. Montreal: The Institute for Research on Public Policy, 1980.

Studnicki, J. The minimization of travel effort as a delineating influence for urban hospital service areas. International Journal of Health Services, 1975, 5(4), 679-693.

Sygit, M. An investigation of the health condition of rural residents over sixty as related to some socio-hygienic aspects of their living standards. La Sante Publique (Bucharest), 1982, 25(3), 209-238.

Teixeira, C.A. A Review Of Methods of Estimating Hospital Service Population. Unpublished Major Paper. Division of Health Services Administration, University of Alberta, 1975.

Taylor, M.G. Health Insurance and Canadian Public Policy. Montreal: The Institute of Public Administration of Canada, 1978.

Thomas, L. On the science and technology of medicine. Daedalus, 1977, 106, 35-46.

Toll, K.A. Hospital Bed Utilization by Levels of Care in Alberta. Unpublished Master's Thesis. Department of Health Services Administration and Community Medicine, University of Alberta, 1982.

Trivedi, V.M. Classification of short-term general hospitals for control and equity. Inquiry, 1978, 15(3), 255-264.

Van Dyke, F., Brown, V., & Thom, A. Long-Stay Hospital Care. New York: Columbia University, 1963, p. 55.

Wan, T.T.H., & Odell, B.G. Factors affecting the use of social and health services among the elderly. Ageing and Society, 1981, 1(March), 95-115.

Ward, R.A. Services for older people: an integrated framework for research. Journal of Health and Social Behavior, 1977, 18(1), 61-70.

Weil, T.P. Do more physicians generate more hospital utilization? Hospitals, 1981, 55(23), 70-74.

Weinerman, E.R. Research on comparative health service systems. Medical Care, 1971, 9(3), 272-290.

Weiss, J.E., & Greenlick, M.R. Determinants of medical care utilization: the effect of social class and distance on contacts with the medical care system. Medical Care, 1970, 8(6), 456-462.

Wennberg, J.E. Factors governing utilization of hospital services. Hospital Practice, 1979, 14(9), 115-121, 126-127.

Wennberg, J., & Gittelsohn, A. Small area variations in health care delivery. Science, 1973, 182(4117), 1102-1108.

Wennberg, J., & Gittelsohn, A. Variations in medical care among small areas. Scientific American, 1982, 246(4), 120-132.

White, K.L., Anderson, D.O., Bice, T.W., Kalimo, E., & Schach, E. Health care: an international comparison of perceived morbidity, health services resources, and use. International Journal of Health Services, 1976, 6(2), 199-218.

Wilson, P.A. Hospital use by the aging population. Inquiry, 1981, 18(4), 332-344.

Windley, P.G. Community services in small rural towns: patterns of use by older residents. The Gerontologist, 1983, 23(2), 180-184.

World Health Organization. The First Ten Years of the World Health Organization. WHO, 1958.

Youmans, E.G. Health orientations of older rural and urban men. Geriatrics, 1967, 22(October), 139-147.

Zimmer, J.G. Length of stay and hospital bed misutilization. Medical Care, 1974, 12(5), 453-462.

Zimmer, J.G., & Groomes, E.W. An observer reliability study of physicians' and nurses' decisions in utilization review of chronic-care facilities. Medical Care, 1969, 7(2), 14-20.

APPENDIX A: METHODOLOGY SUPPLEMENT

A1: Exponential Model of Population Estimate Calculation
for Intercensal Years

A2: Weighted-Sum Method for Age-Sex Adjustment

A3: General Hospital Districts in Alberta

A4: Formulae for Calculation of Relevance and Commitment
Indices

APPENDIX A1

EXPONENTIAL MODEL OF POPULATION ESTIMATE CALCULATION FOR INTERCENSAL YEARS

Assumption: For each district, the yearly census and service (age-sex adjusted population growth (increase or decrease) is assumed to occur at a unique constant rate.

Based on the foregoing assumption, the yearly rate of population growth for a given district was computed according to the following formula:

$$R = \text{Exp}\,(\text{Ln}\,(P2/P1)) / n$$

Where

R = rate of population increase or decrease

Exp = exponent

Ln = natural logarithm

P1 = census or service population for base year (1971 or 1976)

P2 = census or service population of boundary year (1981 or 1976)

n = number of years between P2 and P1

Finally, district-specific census and service population estimates for intercensal years were calculated in a compounding manner, as follows:

P72 = P71 x R1	P77 = P76 x R2
P73 = P72 x R1	P78 = P77 x R2
P74 = P73 x R1	P79 = P78 x R2
P75 = P74 x R1	P80 = P79 x R2

Where

R1 = rate of population growth between 1971 and 1976

R2 = rate of population growth between 1976 and 1981

APPENDIX A2

WEIGHTED-SUM METHOD FOR AGE-SEX ADJUSTMENT [1]

Age-sex adjustment removes the confounding effect of the variability of the age-sex composition of the population among hospital districts, thereby, allows for meaningful comparison of interdistrict hospital utilization rates. By way of the weighted-sum method of age-sex adjustment, a relative per capita resource requirement for serving a specific age-sex group, in comparison with the total population of the study area, is obtained. The resulting age-sex adjusted population figure is defined as the district service population.

The general formula for calculating an age-sex adjusted population figure for a district district is

$$N_{.j} = \sum_k W_k P_{kj} \qquad (1)$$

Where

$N_{.j}$ is the age-sex adjusted number of residents in the jth district.

W_k is a weight, applied to the kth age-sex group, which represents a relative per capita resource requirement for serving the kth age-sex group in comparison with the total population of the province.

---

[1] Bay, K.S. & Nestman, L.J. A hospital service population model and its application. International Journal of Health Services, 1980, 10(4), 677-695.

P_{kj} is the raw sum of the number of residents in the kth age group in district j.

For this study, W_k was established by the ratio of an age-sex specific utilization rate to the total elderly utilization rate, and was calculated as follows:

$$W_k = (D_k / P_k)/(P../D..) \qquad (2)$$

Where

D_k is the total utilization (separations) generated by the kth age-sex group

P_k is the number of persons in the kth age-sex group.

D.. is the total number of resources utilized, as measured by the total number of separations generated by all elderly age groups in the province

P.. is the total provincial elderly population

Combining 1 and 2 above results in

$$N_{.j} = \sum_k (D_k P../P_k D..)/(P_{kj}) \qquad (3)$$

The sum of all age-sex adjusted district populations ($N_{.j}$) yields the age-sex adjusted elderly population for the entire province (N..), as indicated below:

$$N.. = \sum_j N_{.j} = \sum_j \sum_k W_k P_{kj} = \sum_k \sum_j W_k P_{kj} = (P../D..)D.. = P..$$

APPENDIX A3

General Hospital Districts in Alberta

GHD No.	General Hospital District Name
1	Mannville
2	Vermilion
3	Drumheller
4	Islay
5	Cardston
6	Bassano
7	Drayton Valley
8	Lloydminster**
9	Hanna
10	Viking
11	High River
12	Provost
13	Athabasca
14	Grande Prairie
15	Red Deer
16	Innisfail
17	Wainwright
18	Elk Point
19	Vulcan
20	Stettler
21	Peace River
22	Consort
23	Myrnam
24	Claresholm
25	Little Bow
26	Olds
27	Taber
28	Brooks
29	Magrath
30	Eckville
31	Raymond
32	Beaverlodge-Hythe*
33	Didsbury
34	Vegreville
35	Oyen
36	St. Paul
37	Ponoka
38	Mayerthorpe
39	Coronation
40	Croswnest Pass
41	Castor
42	Two Hills
43	Bentley
52	Rimbey
53	Empress
53	Lacombe
55	Flagstaff-Hughenden*
56	Trochu
57	Glendon
59	Fairview
60	Spirit River
61	Boyle
63	Grande Cache
64	Lamont-Mundare-Willingdon*
65	Lethbridge*
66	Turner Valley
67	Barrhead
69	Medicine Hat
70	Manning
71	Banff
72	Bow Island
73	Smoky Lake
75	Cold Lake**
76	Hinton
78	Lac La Biche
79	Pincher Creek
80	Canmore
81	Wetaskiwin
82	Picture Butte
83	Leduc*
84	Stony Plain
85	Breton
86	Edson
87	Jasper
88	Bonnyville*
89	High Prairie
90	McLennan
91	Westlock
92	Camrose
93	Metro-Calgary*
94	Bashaw
95	Border Counties
96	Valleyview
97	Whitecourt
98	Fort Saskatchewan
99	Fort McMurray

44	Elnora	100	Sturgeon
45	Three Hills	101	Slave Lake
46	Cereal	102	Fort Vermilion-High Level*
47	Tofield	103	Thorhild County
48	Fort Macleod	105	Vilna
49	Rocky Mountain House	106	Metro-Edmonton*
50	Berwyn	149	Devon
51	Sundre	150	Blood Indian Reserve**
		154	County of Wheatland**

* More than one hospital located in the district
** No hospital located in the district

APPENDIX A4

FORMULAE FOR CALCULATION OF RELEVANCE AND COMMITMENT INDICES

I. Relevance Index (RI)

a) RI of a District to the Hospital(s) located in the same District equals

$$\frac{\text{Number of Resident District Separations from the District Hospital(s)}}{\text{Total Number of Resident District Separations from all Hospitals in the Province}} \times 100$$

b) RI of a District to the Hospital(s) not located in the District equals

$$\frac{\text{Number of Resident District Separations from all Non-DistricT Hospitals}}{\text{Total Number of Resident District Separations from All Hospitals in the Province}} \times 100$$

II. Commitment Index (CI)

a) CI of a Hospital to the District in which it is located equals

$$\frac{\text{Number of Resident District Separations from the District Hospital}}{\text{Total Number of District Hospital Separations}} \times 100$$

b) CI of a Hospital to All Districts Hospital is located equals

$$\frac{\text{Number of Non-Resident District Separations from the District Hospital}}{\text{Total Number of District Hospital Separations}} \times 100$$

Note: Patient-days or admissions may be substituted for separations in the above formulae.

JOB NO. 847422 UNIVERSITY OF ALBERTA COMPUTING SERVICES (SYSTEM PR195) 23:50:25 Mon Apr 22/85

User: SZAO
Project no: THSZ

**** In at	23:50:08	Mon Apr 22/85	
**** On at	23:50:25	Mon Apr 22/85	
**** Off at	23:50:44	Mon Apr 22/85	
**** Batch,Low,Internal/Teaching,Research			
**** Elapsed Time	.3	Min.	
**** CPU Time Used	8.207	Sec.	$1.09
**** CPU Stor VMI	20.8	Page-min.	$.91
**** Wait Stor VMI	.415	Page-hr.	
**** Cards Read	5		
**** Lines Printed	26682		
**** Pages Printed	771		$10.02
**** Images printed	774		$13.62
**** Disk I/O	1783		$.14
**** Approx. cost of this run is			$25.80
**** Approx. funds remaining			$270.22
**** Disk space remaining	197	Pages	

**Last Signon was: 23:23:52 Mon Apr 22/85